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MEDICAL JOURNAL

Volume 69 N°3

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MEDICAL JOURNAL

Established in 1923, An Undergraduate Publication

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Editorial

Each year, the UTMJ awards several prizes to articles published in this Volume. The UTMJ is pleased to announce the winners of the following awards.

The University of Toronto Medical Journal Prizes for Literary Excellence are awarded to the top three articles as selected by the editorial staff on the basis of the following criteria: Originality, style, general interest, review of relevant literature, interpretation of results or relevant background information, critical analysis and discussion, adequate and appropriate use of illustrations, length of article in relation to materials covered and overall contribution of knowledge to UTMJ readers.

First prize of $100 has been awarded to Vivek Rao and Bernard Goldman for their article entitled "Mitral valve replacement: The search for the ideal prosthesis" which was published in Vol. 69 No.2.

Second prize of $50 has been awarded to Arial Waitzman and Jeffrey Posnick for their article entitled "Craniofacial surgery: Correction of Orbital Hypertelorism" published in Vol. 69 No.1.

Third prize of $50 has been awarded to "Colorectal Carcinoma in a Young Female and Literature Review" by Rod Willoughby, Savvas Nicolaou and Hartley Stern.

The best article in the field of orthopaedics as selected by the Department of Orthopaedics receives the R.I. Harris Award. This year's winner is entitled "A comparative review of Goretex and iliotibial band replacement for ACL insufficiency" by Richard Kaminker.

Dr. Richard Gladstone is pleased to announce the winner of the Gladstone Award for the best article in the neurosciences. This year's winner is "Neurogenic tumors of the skull base: A case review approach" by Peter Chi, Adrian Priesol and Jeremy Freeman.

We would like to congragulate the recipients of this year's awards and we thank the many authors who have submitted work to the UTMJ this year. In addition, we would like to thank the members of the editorial board, our art director Gino Maulucci and the artists from the Division of Biomedical Communications. A special thank-you to Audrey Randall who has remained tireless in her support for the UTMJ and to Sarah Beaton whose cover art serves to illustrate this issue's feature article on facial fractures.

As retiring editors-in-chief, we leave the UTMJ in the very capable hands of Nora Cullen and James Scott.

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The Medical Student's Guide to Facial Fractures

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Abstract

Facial fractures are frequently encountered by Emergency Room physicians, and can have serious sequelae if not managed properly. This article reviews the signs, symptoms, imaging techniques, and general modes of treatment of the common facial fractures, including fractures of the mandible, zygomatico-maxillary region, orbital floor, and nose. An approach to assessment is presented.

Introduction

Facial fractures are frequently seen in the Emergency Room, either alone or in combination with other serious injuries. Due to the complexity of cranial anatomy and the relatively little attention paid to this problem in the medical curriculum, facial fractures are often missed, misdiagnosed, or mistreated. The goal of this paper is to present the basic concepts of diagnosis and management of the various common facial fractures.

The etiology of facial fractures has been examined by several authors over recent years[1-5]. The two most common causes are assaults and motor vehicle accidents (MVAs) which account for between sixty and eighty percent of these injuries[1,3,4]. The majority of the remainder is related to athletic[1,2,3] and industrial accidents[1,5].

The first priority in head and neck trauma is to secure the patient's airway, maintain ventilation, control bleeding, and assess for life-threatening injuries especially of the brain and thorax[6,7]. A longstanding concern has been the frequency of cervical spine injuries accompanying facial fractures. This has recently been estimated to occur at a low 1.3% of all facial fractures or 5.3% of those occurring in MVAs[8]. Eighty-five percent of C-spine injuries associated with facial fractures occur in MVA victims[8]. Head injuries are much more frequently seen[7]; Sinclair estimated that 85% have head injuries, about half of which are serious[9].

One third of patients have multiple facial fractures[1], the average number being 1.8[4]. Fracture type is to some degree age-related[10] but mandibular fractures are the most frequent, followed by zygomaticomaxillary, orbital floor and nasal fractures[1,2,4,9]. The low incidence of nasal fractures is probably due to low attendance at the Emergency Room where these studies were compiled.

Assessment of Facial Fractures

Patients are assessed using the history which may suggest the mechanism and degree of force of the injury, and indicate specific symptoms (See Table 1), physical examination (See Table 2) and imaging techniques. Radiographs have been the traditional imaging method employed (See Table 3), but in some instances CT is very helpful.

Table 1: Symptoms of facial fractures

1. Pain, tenderness
2. Swelling, ecchymosis, lacerations
3. Facial asymmetry, deformity
4. Dental malocclusion ("Bite is off")
5. Impaired jaw movement
6. Diplopia, reduced visual acuity
7. Epistaxis
8. Obstructed breathing
9. Numbness of the face

Table 2: Physical examination of facial fractures

1. Symmetry, deformity
2. Lacerations, abrasions, ecchymoses- include intraoral, intranasal
3. Palpate: orbital rims, zygomatic arches, nose, frontal bones, mandibular borders (look for step deformities, crepitation)
4. Elicit movement of dental arches
5. Note fractured, avulsed, mobile teeth and occlusion
6. Pupil reflexes, extraocular muscle function, diplopia, visual acuity and fields
7. Intranasal exam: septal hematoma, airway obstruction, CSF rhinorrhea
8. Facial movement including jaw excursions
9. Facial sensation

A routine radiographic series consists of three views: the Water's, the Caldwell, and the lateral[11](Figure 1a-e). The Water's view is an occipitomental image with the X-ray beam angulated upward[11]. The orbital floor is roughly perpendicular to the film and the thick petrous temporal bone is projected inferiorly to the maxilla[11]. This view is the most universally useful one as it shows the maxillary sinuses, the orbital rims and zygoma clearly. The Caldwell view is an occipitofrontal image made by angulating the X-ray beam slightly less, which reveals the frontal region, superior orbital fissure and the orbital floor[11]. The lateral view best shows the frontal sinus and orbital roof[12].

The mandible requires special views to adequately assess it's horseshoe shape. The most valuable film is the panoramic view which is made by rotating the X-ray beam and the film around the patient's head[12]. It shows the jaws in their entirety. Lateral oblique views of the mandible can be used if a panorex machine is not available but distortion and overlap often render these difficult to read (Figure 2). As well, posteroanterior (PA) views centered on the mandible, occlusal films or a Townes (AP) view will also elucidate various regions of the mandible[11-13]. Although diagnosis of facial fractures is not limited by poor image quality[14], sometimes adjunctive studies are necessary after the initial radiographic survey.

The majority of British oral and maxillofacial surgeons felt that CT gave a diagnostic advantage over plain radiographs[15]. Despite this, the current practice in most institutions is to use CT after the initial screening with at least a Water's view[16] or if inadequate information is obtained from radiographs[11]. Useful information is theoretically obtained in about half the cases where CT is employed[17], most likely by clarifying the degree of comminution and displacement which relates to the type of surgical exposure and fixation that will be required[16,18,19]. Different authors feel that the value of CT lies in different diagnostic dilemmas; most frequently cited is the better elucidation of orbital and nasoethmoidal regions[8,11, 16,20] and the maxillary sinuses and zygomatic arch[11,21]. Many feel that CT scanning is essential in mid and upper facial fractures[12].

The clinical approach to each region of the face will be discussed separately, and the principles of management of the most common types of facial fractures will be outlined.

Mandibular fractures

Mandibular fractures are classified according to their location[22,23], angulation, position of teeth around the fracture line[24], whether they are open or closed, simple or comminuted (See Table 4 and Figure 3). Most fractures occur at the angle or the condylar neck, both regions of relative weakness[12,22]. The angle of the fracture can allow either distraction or reduction of the fracture with muscle pull. Favourable fractures are those which are reduced by the pull of the attached muscles[12,24]. Location of teeth has importance in conservative treatment; teeth on both sides of the fracture can be wired together to stabilize the bony fragments[24]. Blows to the chin tend to produce bilateral fractures while blows to the side of the face produce ipsilateral subcondylar and contralateral angle or body fractures[11].

Table 3: Radiographic survey for facial fractures[11,12,25]

Structure	Best View
Mandible	
- condyle, coronoid process,	Lateral oblique
- ramus, body	Water's
- condyle and neck	Reverse Townes
- symphysis	Occlusal
-symphysis, body, ramus	Panoramic
Maxilla and zygoma	Water's Lateral
Frontal and orbital floor	Caldwell Water's

Table 4: Classification of mandibular fractures[22-24]

Location	Incidence
Condylar neck	36%
Angle	20%
Body	21%
Symphysis	14%
Ramus	3%
Coronoid process	2%

Position of teeth

Class I Teeth on both sides of fracture line
Class II Teeth on one side of fracture line only
Class III No teeth on either side of fracture line

Angulation

Favourable
Unfavourable

General

Open vs. closed
Simple vs. comminuted
Single vs. multiple

Symptoms of mandibular fractures include pain, the sensation that one's bite is off, numbness of the chin or lower lip, and abnormal lower jaw movement[12,24-26].

Examination includes first inspection for intraoral or extraoral lacerations, abrasions and ecchymoses. A sublingual hematoma is classic for a mandibular fracture[13]. The external auditory canal should be examined since occasionally displaced condylar fragments can pierce the canal causing it to fill with blood, while the tympanic membrane appears normal[25,26]. Loose, avulsed or fractured teeth, steps in the occlusal plane or lack of complete intercuspation may be apparent[12]. Inability to open the mouth due to trismus (spasm of the masticatory muscles) or deviation of the chin to one side are also seen.

Palpation anterior to the tragus will produce pain in condylar neck fractures and abnormal motion of the condylar head may be felt in these instances. The tooth-bearing alveolus should be grasped and bony fragments can be felt to move independently[24,25]. The borders of the mandible should be palpated to ensure their continuity[25].

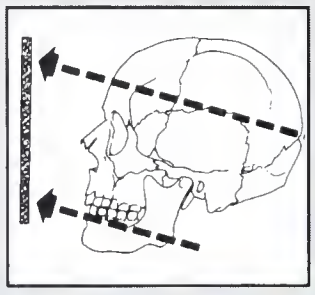

Figure 1a - Caldwell View (15°)

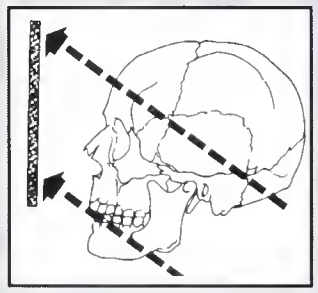

Figure 1b - Waters View (30°)

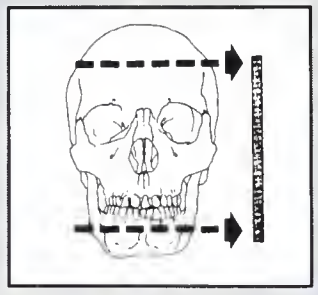

Figure 1c - Lateral View

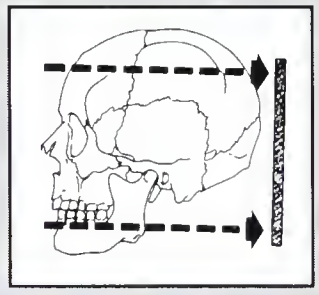

Figure 1d - Townes AP View

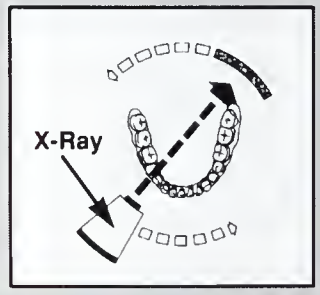

Figure 1e - Panoramic View

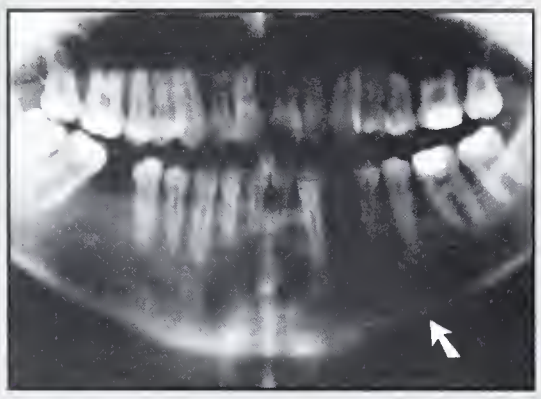

Figure 2

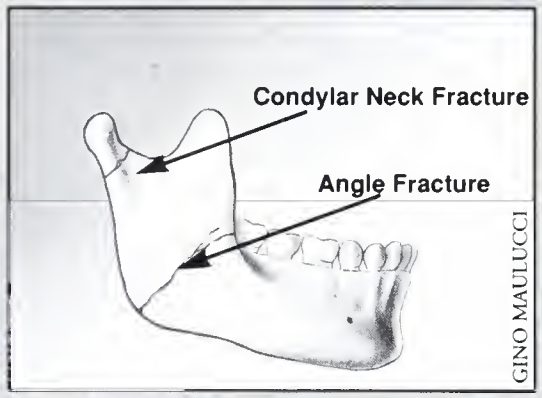

Figure 3

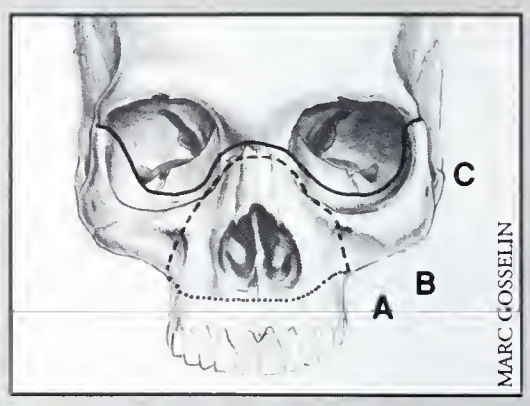

Figure 4

Figure 2 - This 28-year-old male was brought to the Emergency Room following a single vehicle MVA. The airway was clear, and the patient alert and oriented. Intraoral examination revealed a mucosal laceration at the left premolar region, hematoma, and pain upon palpation and occlusion. This panoramic radiograph was ordered and a fracture of the left mandibular body was noted (arrow). The fracture of the right subcondylar region was not seen due to the poor radiologic technique; the patient was malpositioned in the Panorex machine and the condyles were projected off the film.

Figure 4 - Diagram showing the configuration of the LeFort fractures. A: LeFort I, a horizontal maxillary fracture. B: LeFort II, or pyramidal fracture. C: LeFort III fracture, separating the facial bones from the cranial bones. The fracture line extends through the orbits, zygomaticofrontal process and the zygomatic arch.

Legend - LeFort Fractures *A ..... LeFort I B - - - - LeFort II C —— LeFort III*

Once the oral cavity and upper airway are cleared, the fracture can be reduced and immobilized. Mandibular fractures are treated with either closed reduction where the teeth are joined with wire loops or are individually wired to a preformed arch bar. The jaws may then be wired together resulting in intermaxillary fixation (IMF)[25]. IMF may be applied under sedation or local anesthesia[27] and is kept in place for 10 to 14 days. Wire cutters are kept by the bedside and oral hygiene is maintained with a Water-Pik[25]. By two weeks the patient's occlusion can be checked and if it is adequate, IMF removed and a soft diet, analgesics and physiotherapy prescribed[25]. By three weeks, bony healing should be clinically apparent[25].

Open reduction with either an intraoral or extraoral approach and interosseous wires, plates and screws, or Kirshner wires is frequently used for mandibular fractures. Plates, although expensive, are currently very popular because they produce a rigid anatomical reduction[28,29] and do not need to be removed after healing is complete[28]. IMF is used intra-operatively to place the fragments, and removed once stabilization is complete[12,24,25,28]. Open reduction is indicated in highly comminuted or displaced fractures[12,26], condylar neck fractures that are dislocated, telescoped, or combined with an unstable midface[31], if there is concurrent maxillary trauma, or if IMF is inadequate (for example the edentulous patient)[25]. Eccentric dynamic compression plates have been devised with beveled screw holes that force the bone screws in at different angles thereby applying both a compressive force and a rotational force to bring a fracture line into contact completely along its length[32].

Some special situations exist, for example condylar neck fractures. If undisplaced, these can be managed with a soft diet, although some clinicians claim that IMF is still necessary. Since IMF does have complications such as tooth extrusion and root hypersensitivity, weight loss, and aspiration of vomitus, it seems wise to avoid its use unless absolutely necessary. Frequently encountered alveolar fractures can be quickly immobilized by applying an arch bar to the involved arch and allowing the patient a soft diet[25].

In the edentulous patient, oral splints or the patient's dentures can be fixated with circumandibular wires. This is less common since the elderly tolerate IMF poorly in part because of the existence of other medical conditions[33]. Undisplaced or minimally displaced fractures can be treated solely with a soft diet and jaw rest[25,33,34].

Controversy has existed over the management of teeth in the fracture line. Generally, extraction of such teeth leads to increased morbidity (infection, hemorrhage, and delayed healing)[35,36] and leaving them in place allows uncomplicated healing and in over half the cases continued tooth vitality[37,38]. Indications for removal of these teeth are root fractures, gross mobility within the bony fragment, interference with reduction, and pre-injury non-restorable caries with periapical radiolucency[39].

Complications of mandibular fractures include chin paresthesia secondary to damage to the inferior alveolar nerve, delayed union, nonunion, infection, and malocclusion[27]. Delayed union usually responds to extended IMF. Nonunion (failure after three months) requires debridement with bone graft and rigid fixation[12].

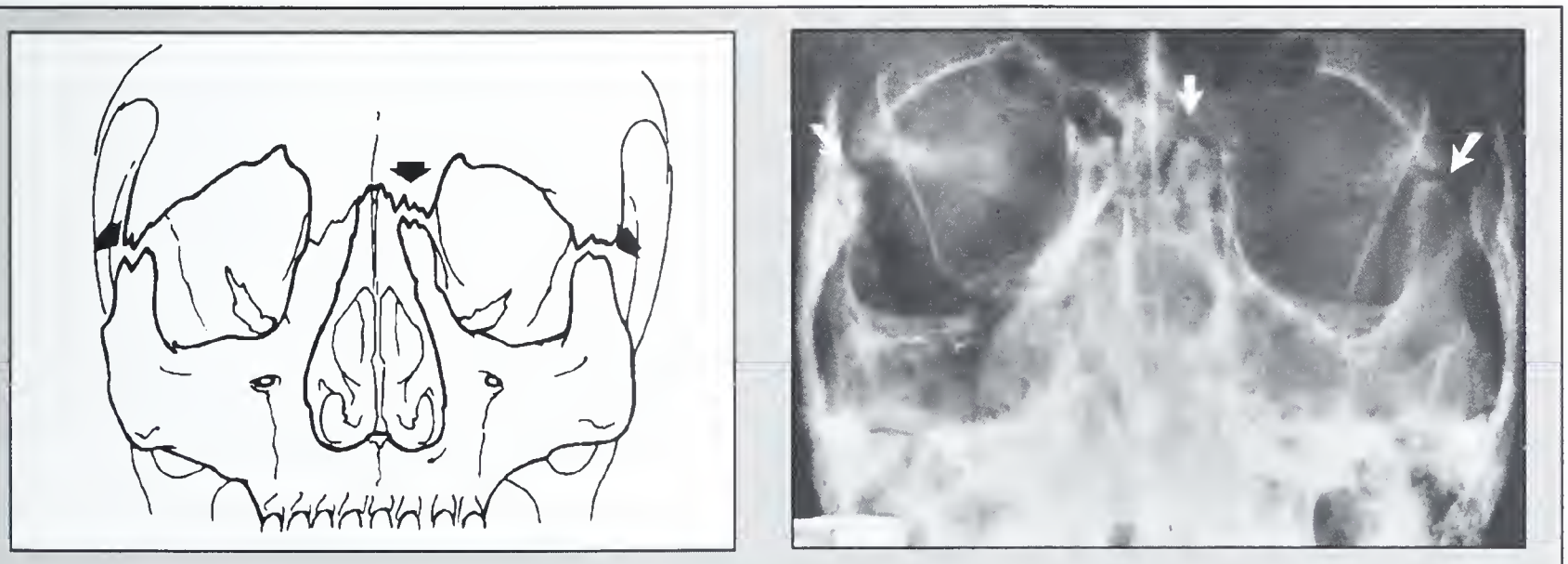

Figure 5 - This Water's view demonstrates a LeFort III fracture. This patient was most likely the victim of massive facial trauma, requiring basic trauma care prior to planning treatment of this fracture.

Zygomaticomaxillary fractures

Midface fractures are serious because they can affect the many important adjacent structures- the orbits, sinuses, and brain. These fractures were classified by the French physician Rene LeFort who used cadaver heads to describe three recurring patterns[12,40]. These were the LeFort I or horizontal maxillary fracture, the LeFort II or pyramidal fracture and the LeFort III fracture, or craniofacial dysjunction[11,12,24,40] (See Figures 4,5 and 6). These types may be unilateral or combined[12].

Symptoms of maxillary fractures include nasopharyngeal bleeding, periorbital bruising, diplopia, numbness over the ipsilateral cheek and maxillary dentition and malocclusion[12,25].

Epistaxis or cerebrospinal (CSF) rhinorrhea may be present[24,26]. The orbital rims should be palpated to check for step deformities and point tenderness[12]. Movement of the maxillary dental arch should be elicited; the level of mobility indicates the fracture location[24]. A complete eye examination should be undertaken[25].

LeFort I fractures may be stabilized with IMF[12,24]. For more complex fractures, the treatment options include internal or external craniofacial suspension and open reduction and internal fixation (ORIF)[41]. Internal suspension involves slinging IMF devices from the nearest superior uninvolved bone (piriform aperture, infraorbital rim or frontal bone) via wire loops[24,41]. This is a rapid, cheap, well-tolerated method but sometimes provides inadequate fixation[41]. External suspension denotes the use of dynamic traction via a frame placed on the face. These are cumbersome, easily disturbed by the patient, and provide non-rigid fixation[41]. Most maxillary fractures are now immobilized with ORIF, usually miniplates and screws[25,42,43]. Anatomic reduction must be maintained during plate placement since fragments cannot be shifted after fixation[41]. A bicoronal approach (an incision in a coronal plane in the scalp) is used to expose extensively comminuted fractures, and grafts of cranial bone or split ribs may be necessary in severe cases[21,44-46]. The optimum time for operative treatment is within five to 7 days post-injury, when edema is resolving but bony union is minimal[41].

There are two types of zygoma fractures, a tripod fracture (separation at the inferior orbital rim, zygomaticofrontal suture and the zygomaticomaxillary buttress) or the less common (16% of the total) depressed fracture of the zygomatic arch[11,12,47](See Figure 7a & b). Ten percent of tripod fractures are undisplaced and require only monitoring, and 31% are displaced without rotation and can be elevated back into place[47].

Symptoms of zygomatic fractures are similar to those of maxillary fractures, as are many of the clinical signs. It is worth comparing the prominence of the malar eminences by looking straight down on the face from overhead, although flattening of the cheek may be masked by swelling[11,25,47](See Figure 8). The zygoma may be movable. The ipsilateral orbit may also be depressed and intruded with deepening of the superior palpebral crease, apparent ptosis without lid paresis and retraction of the lower eyelid[47,48]. Neurological signs include diplopia, gradual loss of vision (due to hematoma compression of

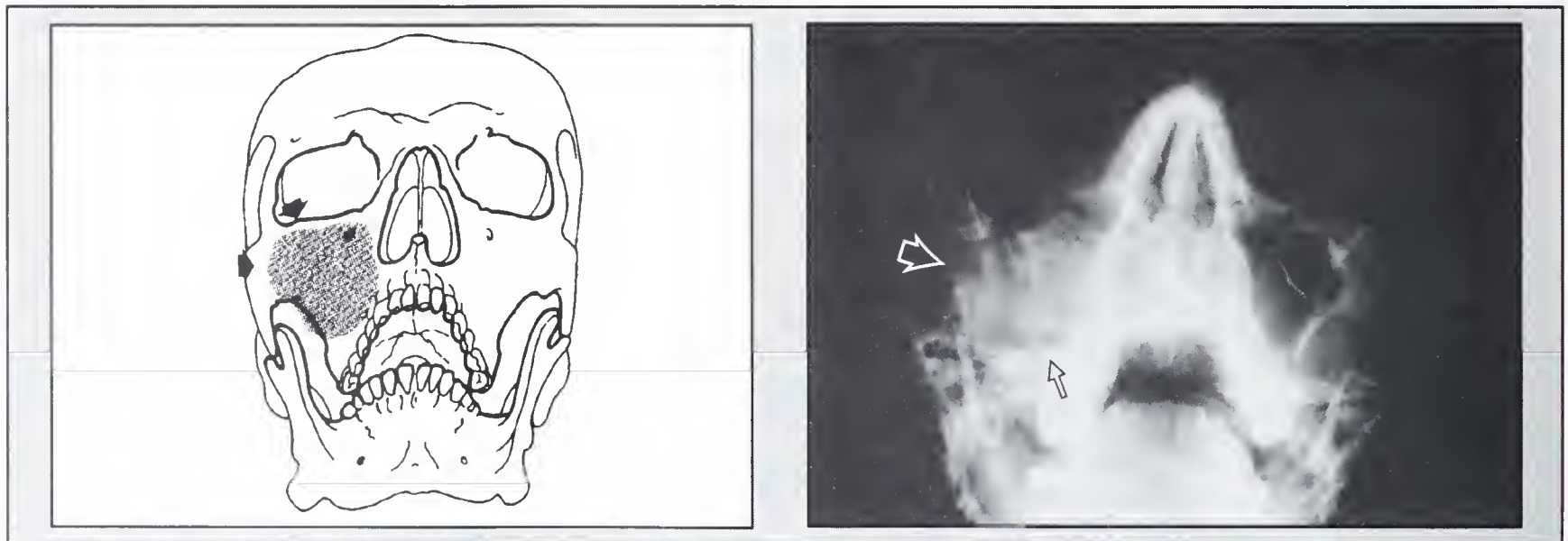

Figure 6 - This 31-year-old male was hit by a baseball on the right side of his face, and presented to his family doctor the next day. He complained of a bleeding nose and a swollen bruised right eye. On examination there was a large ecchymosis overlying the right eye, subconjunctival hemorrhage, and possibly a flattened right malar eminence, although this was difficult to discern due to swelling in the area. This Water's view was returned as part of the radiographic survey and it demonstrates a cloudy right maxillary sinus (arrow), a classic sign of a maxillary fracture.

the optic nerve[12]), and anesthesia in the distribution of the infraorbital nerve[47,25]. Intraoral examination may reveal ecchymosis in the upper buccal sulcus[47].

Unrotated tripod fractures can be snapped back into place using a long thin elevating instrument passed underneath the zygoma[47]. The instrument may be inserted at several locations- the classic is the Gillies approach where a small incision is made overlying the temporalis muscle and the instrument is easily slid down the surface of this muscle until the tip underlies the zygoma[48]. Rotated tripod fractures and depressed arch fractures which may impinge on the coronoid process of the mandible should be reduced anatomically with ORIF[11,48].

Fractures of the orbital floor

Orbital blowout fractures occur in the floor (69%) or the medial wall (18%) of the orbit or both (12%), with sparing of the orbital rim[11,49-52]. Two mechanisms can account for this type of injury. A blow to the thick orbital rim can lead to linear fractures(s) of the floor with subsequent soft tissue entrapment since the bone rebounds back into place faster than the orbital contents do[50,51]. Alternatively, blunt force to the eyeball can lead to increased intra-orbital hydraulic pressure which when transmitted to the very thin bone in the orbital floor causes it to fracture[49,50].

Blowout fractures result in an increase in the orbital volume and thus enophthalmos. Periorbital edema and hemorrhage can mask this allowing a gradual onset of enophthalmos, superior palpebral groove accentuation and diplopia on upward or downward gaze[49,50], the latter due to entrapment of the inferior rectus muscle[49]. Subconjunctival hemorrhage, chemosis and globe injuries are common[11,12].

Examination is much like that described for zygomaticomaxillary fractures; a complete eye examination, evidence of bone displacement and infraorbital nerve injury should be sought[12,52]. The forced duction test, where the conjunctiva is anesthetized then the inferior rectus insertion grasped with forceps and pulled to rotate the globe up and down, is used to demonstrate muscle incarceration[12].

Water's views show medial wall blowouts as opacification of the ipsilateral ethmoid sinus, and possibly the depressed fragments of floor blowouts[11]. CT is often necessary to document these fractures[11,12,16,26].

In symptomless cases, frequent follow-up should be carried out since late enophthalmos and diplopia can develop[52]. Surgery is necessary if nonconjugate eye movements or acute enophthalmos is present, and this is

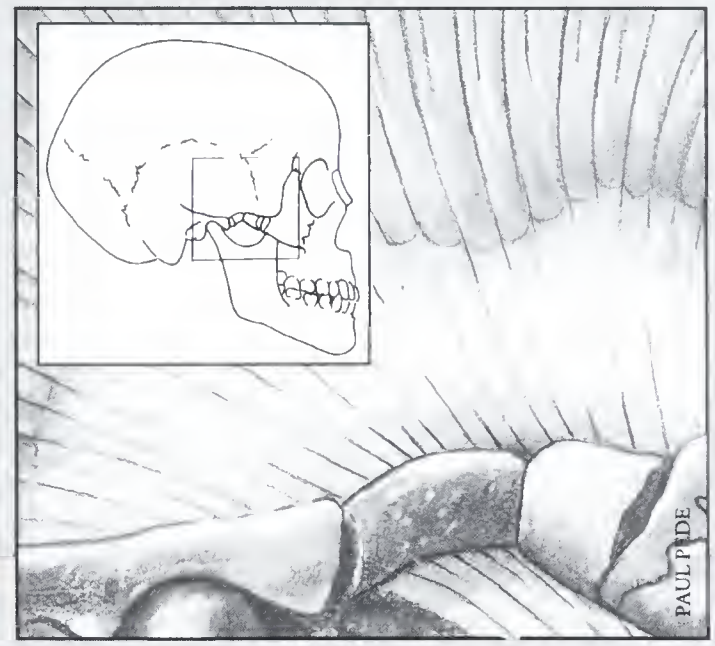

Figure 7a - Depressed fracture of Zygomatic arch

Figure 7b - Tripod fracture of the Zygoma

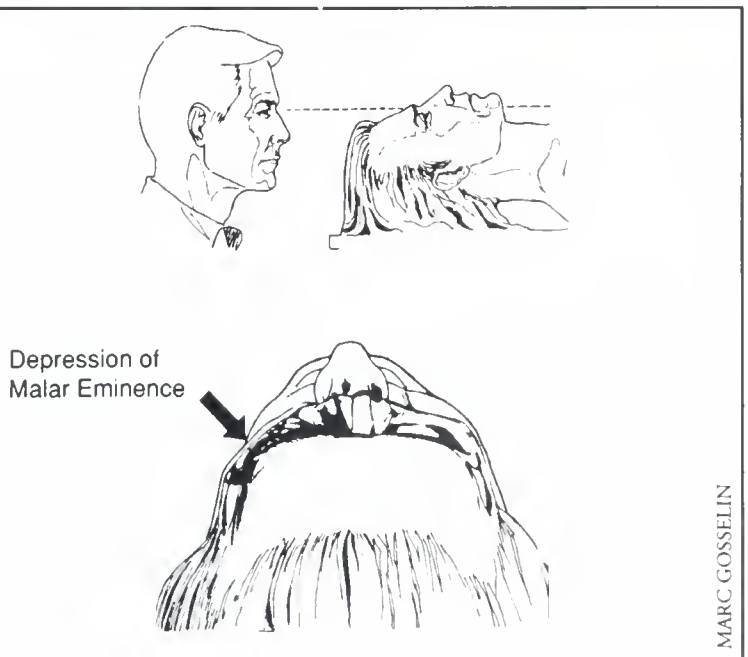

Figure 8 - Comparing prominence of malar eminence

best done seven to ten days post-injury[52]. A small incision is made in the lower eyelid and the orbital floor is carefully dissected. Simple fractures may be elevated with a skin hook[52]. Usually a graft is required but since bone grafts tend to be too bulky for this area[52] alloplastic materials including Teflon[53], Marlex mesh[52], and Medpor[12] have been used[44]. Late reconstruction yields generally poor results, in part due to orbital soft tissue contraction[54].

Complications of surgical treatment of blowout fractures include persistent diplopia, hypesthesia, ectropion, epiphora, and rare visual loss[52].

Nasal fractures

The difficulty in diagnosis and satisfactory treatment of nasal fractures lies in the complex anatomy of this apparently simple organ. Nasal fractures have been classified according to the direction of impact and the level of injury[26,55]. Lateral forces are most common and these fractures typically have a good prognosis[26]. Anterior force can produce more serious injury[26]. Fractures distal to the nasal bones tend to have minimal signs and symptoms, otherwise fractures limited to the external nose present with asymmetry, ecchymosis, swelling and tenderness[55,56]. A deviated septum, mucoperiosteal tears and septal hematoma or epistaxis may be seen[56]. Palpation reveals mobility and crepitation of the nasal bones, sharp edges, depressions, or irregularities[56]. The most serious injuries involve fractures of the naso-orbito-ethmoidal complex and present with severe midfacial trauma[55]. The intercanthal distance is increased with blunting of the medial canthi[55]. CSF rhinorrhea and other facial fractures may be present[55]. These fractures require expert management.

Early management of nasal fractures includes maintaining the airway, dealing with open injuries, bleeding and hematomas, and applying a topical decongestant intranasally to inspect the mucosa[56]. The patient is instructed to apply ice packs and keep the head elevated for the first 48 hours and is re-examined on the third day post-injury[56].

Reduction of nasal fractures can be obtained through open or closed methods. Closed reduction of the septum is achieved with Asch forceps while the nasal bones are reduced with Walsham's forceps. Both are applied intranasally and combined with external manual molding[12,26,56]. This correction is maintained with intranasal Bacitracin soaked gauze packs combined with oral antibiotics, and an external splint of plastered gauze or thermoplastic material left on for seven to fourteen days[26,56]. Comminuted fractures require open reduction and fixation with slowly absorbing sutures, subcutaneous wires or miniplates, with later removal of hardware[56].

Septal hematomas are important to diagnose. These must be drained since the septal cartilage obtains its blood supply from the overlying mucoperiosteum and an intervening hematoma obstructs this supply[56]. If left in place, cartilage necrosis ensues eventually healing with fibrosis and contraction causing retraction of the nasal tip and depression of the nasal dorsum (a saddle nose deformity)[56]. Aspiration of the hematoma followed by nasal packs or intranasal placement of small Silastic splints fixed with a transseptal suture is necessary to preserve the cartilaginous septum[56].

Conclusion

Facial fractures are important to detect early since they can have major functional and cosmetic sequelae. Signs and symptoms of facial fractures should be carefully sought and separated from those of soft tissue injury. In suspected cases a proper radiographic survey should be completed, usually including a Water's view and special views for the area in question. Many types of injuries can be treated in the Emergency Room but the rest require prompt consultation with specialists in otolaryngology, oral surgery, and plastic surgery.

Acknowledgement

Thanks to Dr. A. Freiberg, Head of the Division of Plastic Surgery at the Toronto Hospital, Western Division for his helpful comments on this manuscript, and his encouragement in this project. Thanks also to the artists of Biomedical Communications for their assistance in illustrating this manuscript.

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Neurogenic Tumors of the Skull Base: A Case Approach

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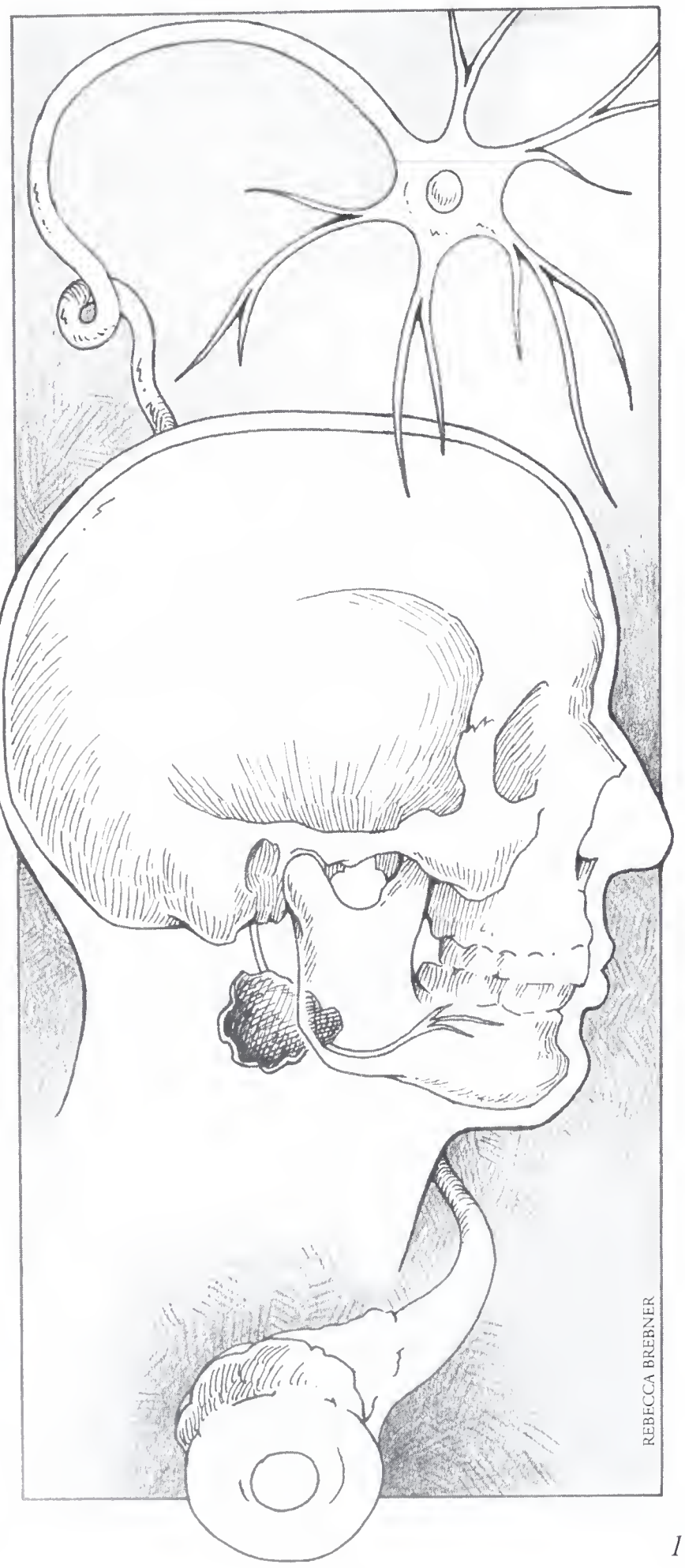

Abstract

Schwannomas and neurofibromas occurring in the base of the skull are particularly interesting to surgeons for their potentially complex anatomical location and their diagnostic and prognostic differences. We present a case report of a neurofibroma arising in the upper cervical region of the parapharyngeal space. The article reviews the distinguishing features of schwannomas and neurofibromas, the two most common neurogenic tumors arising in the head and neck region, from the stand point of clinical presentation and histologic findings. The limitations and advantages of computerized tomography and magnetic resonance imaging over physical exam in evaluating a neck mass have also been addressed.

Introduction

The head and neck region is one of the most frequently reported locations for benign neurogenic tumors and a rare site for malignant neurogenic tumors. These tumors all develop from the proliferation of normal cells of the peripheral nerve sheath. The extensive presence of nervous tissues in the base of the skull, in particular, the cranial nerves, can potentially give rise to primary neurogenic neoplasms in many complex areas. Recently, surgery of the skull base has gained surmountable advances in increasing accessibility to many vital and intricate areas. In conjunction with the employment of CT and MRI scanning, many lesions of the skull base which were previously unresectable are now surgically approachable.

Benign peripheral nerve sheath tumors include both schwannomas and neurofibromas, each having distinctive histologic appearances. Schwannomas are by far the most common neurogenic tumors that can arise in the skull base[1]. The histologic differentiation between these neurogenic tumors has significant clinical importance in the management and the prognosis of the patient. Schwannomas are not typically associated with malignant potential; however, some malignant neurogenic sarcomas are known to be derived from benign neurofibromas.

A case history is used to discuss and compare the clinical, diagnostic, and histologic features of schwannomas and neurofibromas occuring in the skull base.

Case Report

The patient is a 32-year-old man with a history of a mass in his left neck area which was discovered as an incidental finding. He came to the ENT clinic complaining of loud snoring and of a seasonal clear watery nasal discharge. He occasionally experienced aches with this mass, but otherwise he had no other localized symptoms. The patient denied experiencing any shortness of breath, dysphagia, shoulder dysfunctions or otalgia. There is no significant past medical history except for a previous rhinoplasty. He had been a smoker for the last 15 years and denied having any allergies.

Examination of the tympanic membranes, and mirror examination of the larynx and nasopharynx were normal. His mass was located in the left neck region under the angle of the mandible and partially covered by the sternocleidomastoid muscle. The mass could be approximated by palpation to be 8 cm by 6 cm and felt soft, poorly circumscribed, easily mobile and slightly irregular in contour. There were no identifiable adenopathies.

Cranial nerves IX, X, XI, XII were examined and shown to be intact. He had no carotid bruits or bruits over the mass. Repiratory, cardiovascular, and abdominal exams were all unremarkable.

Multiple contiguous axial images were performed by computerized tomography (CT) from the base of the skull to the thoracic inlet. The examination was performed with intravenous contrast medium. Figure 1a illustrates the levels of the axial planes from which CT images were generated, numbered from 2 to 23. A mass lesion can be viewed on the CT images generated from levels 9 to 12 as shown in figures 1b and 1c.

The mass was located parapharyngeally within the left carotid space and measured 6 cm in length, 4.3 cm in anterior-posterior diameter, and 2.5 cm in width. The mass was inhomogeneous and was predominantly of lower density than muscle. There was anterior displacement of the carotid vessels and compression laterally of the internal jugular vein. There was no evidence of lymphadenopathy.

The mass seemed poorly vascularized since it was less visualized than the carotid vessels. This was further confirmed by digital subtraction angiography (DSA). The radiologic findings suggested that the mass was neurogenic in origin. A note is also made regarding the presence of a large left submandibular gland as compared to the right.

The neck was explored via a transverse incision approximately 3 cm below the angle of the mandible. Lateral retraction of the sternocleidomastoid revealed a large tumor at the base of the skull over-lying and closely adherent to the hypoglossal and vagus nerves (Figure 2a). Meticulous dissection was used to free the nerves from the lesion (Figure 2b). It was apparent that the tumor emanated from the sympathetic chain. A surgical specimen of the mass lesion was submitted to pathology for histologic evaluation.

The gross specimen appeared as an oval tan nodule measuring 5.5 X 2.6 X 2.2 cm. Serial sectioning revealed a white amorphous tissue throughout, without any

Figure 1a

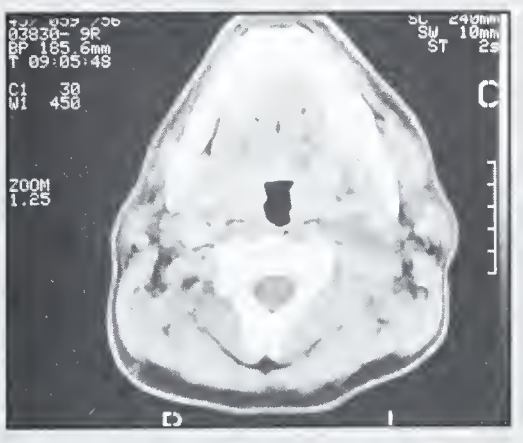

Figure 1b

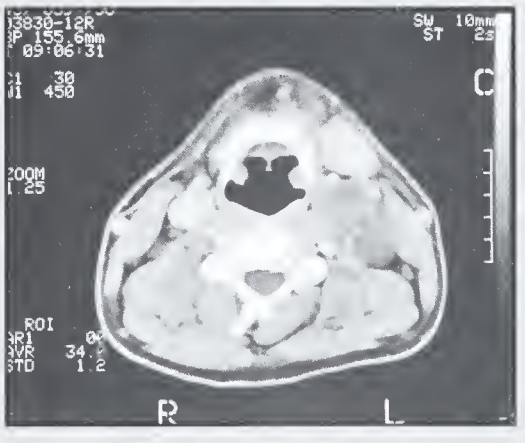

Figure 1c

Figure 1 - CT scans of the neck: (a) shows the levels of the axial cuts taken from the skull base to the thoracic inlet, (b) the scan of level 9 with contrast enhancement, (c) the scan of level 12 with contrast enhancement. Note that the mass marked by "X" is hypodense and hypovascular compared to the adjacent muscle tissue . The mass is located in the left carotid space.

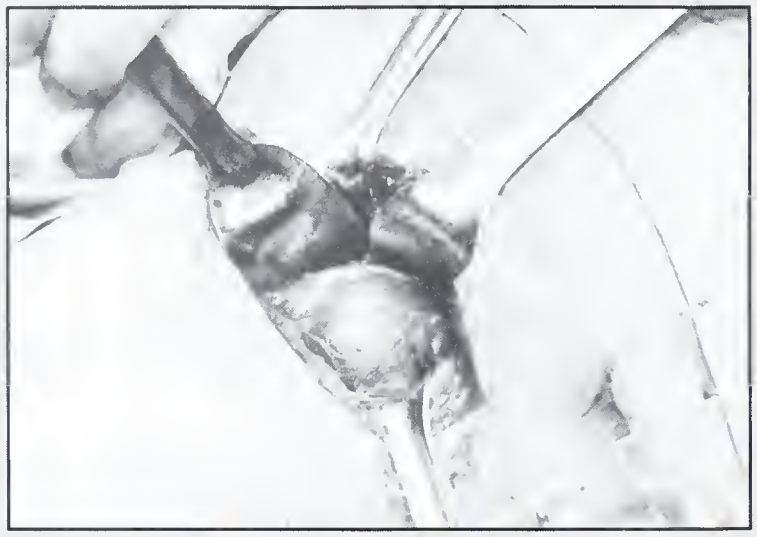

Figure 2a

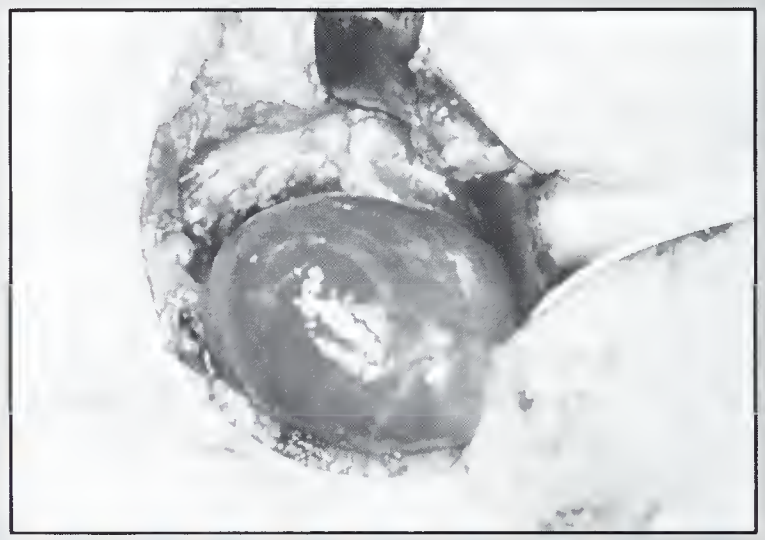

Figure 2b

Figure 2 - Surgical resection of the neurofibroma arising from the sympathetic cervical chain: (a) lateral retraction of the sternomastoid with vagus nerve adhering to the tumor, (b) the freed tumor following resection of the adherent nerves.

evidence of necrosis. The tumor appeared soft, gelatinous, and quite uniform.

Microspcopic examination of the nodule revealed a loose stroma consisting of spindly and wavy cells (Figure 3a). There was significant nuclear pleomorphism with hyperchromatism, irregularity, and enlargement of some of the nuclei (Figure 3b). The vascularity of the tumor is prominant and some vessels show hyalinization (Figure 3b). There was no identifiable cell necrosis or mitosis. The specimen also showed a lymph node with reactive changes but without any evidence of malignancy. The margins of the lesions were examined and indicated that the lesion was likely to have been completely excised.

Immunohistochemical studies showed intense positivity for S-100 (Figure 3c) and negativity for GFAP. These histologic findings were diagnostic of a non-plexiform cellular neurofibroma.

Post-operative anisocoria was noted with a smaller pupil on the left. This was likely a manifestation of Horner's syndrome consistent with involvement of the cervical sympathetic chain. He otherwise had an uneventful postoperative history.

Discussion

The upper cervical area of the parapharyngeal space is the most frequently reported location for the presentation of benign peripheral nerve sheath tumors in the skull base. These neurogenic tumors of the upper neck most often involve the lower cranial nerves (IX, X, XI, XII) and the cervical sympathetic trunks. Collectively, there have been slightly more than 220 case reviews of vagal nerve neoplasms[2,3,4] and fewer than 100 cases of jugular foramen neuromas reported in the literature[5]. These neuromas can often extend into the jugular foramen, where cranial nerves IX, X, and XI exit[2,3,4,5] and cause significant morbidity. The rigid structure of the jugular foramen cause significantly more compressive injuries to the cranial nerves in comparison with tumors lower in the neck. Peripheral nerve sheath tumors involving other locations such as the mandible, larynx, and neck are much less common[6,7]. Only 53 cases of schwannomas and 3 cases of neurofibromas involving the intraparotid facial nerves have been reported[8]. Cases of neurofibromas involving the cervical sympathetic chain are indeed relatively rare. As far as we know, there have been no documented case reports of solitary neurofibromas of the cervical sympathetic chain.

Clinical presentation of neurogenic tumors in the skull base can often be insidious in nature. Cranial nerve paralysis, paresis, or irritability are the more frequent symptoms of skull base lesions. Analysis of the involved cranial nerves coupled with the understanding of the three-dimensional anatomy of the skull base will often permit close approximation of a tumor's location prior to diagnostic imaging.

Isolated involvement of the glossopharyngeal nerve usually presents with sparse physical findings. The most common presentation is the deviation of the soft palate towards the involved side. Occasionally, one finds an attenuated carotid sinus reflex or taste in the posterior tongue on the ipsilateral side.

Paresis of the vagus nerve in the skull base is almost always symptomatic and often results in dysphagia and consequently chronic aspiration. Hoarseness is most often absent, particularly with slow onset of paresis which permits vocal cord compensation by hyperabduction of the contralateral vocal cord.

The involvement of cranial nerve XI produces paresis or paralysis of the ipsilateral sternocleidomastoid and trapezius muscles. Atrophy of these muscles may be present with longstanding involvement.

Hypoglossal paralysis produces deviation of the tongue to the affected side with atrophy and fasciculations. If this deficit was combined with paralysis of cranial nerves VII, IX, or X the patient may also experience increased difficulties in chewing, swallowing, and articulation.

Pathology

Schwannomas and neurofibromas are the most common neurogenic tumors arising in the head and neck region. While both are thought to arise from Schwann cell[9], neurofibromas have much greater malignant potential especially when associated with Von Recklinghausen's neurofibromatosis[10]. Furthermore, schwannomas tend to grow adjacent to the nerve fibres making surgical excisions without loss of complete neural function possible[9]. In contrast, neurofibromas result from the polyclonal proliferation of Schwann cells and fibroblastic supporting elements of the neuron[10]. Nerve fibres become dissociated and scattered throughout the neurofibroma making surgical excision without loss of neural function impossible. It is, therefore, important to be able to differentiate between these two types of neoplasms.

Grossly, both schwannomas and neurofibromas are firm, white to gray colored masses on peripheral nerves. There are several gross characteristics that may aid in differentiating the two types of tumors (Table 1). Microscopically, both are composed of spindle cells. Schwannomas can have both regions of high cellularity, referred to as Antoni A areas, and regions of low cellularity, the Antoni B areas. Verocay bodies, which are patterns of palisading nuclei, can be found in Antoni A areas. Furthermore, schwannomas often have hyalinization of their blood vessels. Neurofibromas typically have loose patterns of interlacing spindle cells along with nerve fibres, fibroblasts, and collagen fibres (ie. all the components of a normal nerve; Figure 3b).

More recently, Johnson et al[11] have demonstrated that cellular heterogeneity produced by infiltrates of mast cells,

Table 1: Gross features of schwannomas and neurofibromas

Feature	Schwannoma	Neurofibroma
texture	firm	firm
color	white to gray	white to gray
number	solitary	multiple
location	proximal nerves and spinal nerve roots	distal nerves and subcutaneous
growth	eccentrically off of nerve	fusiform enlargement
encapsulated	yes	not always

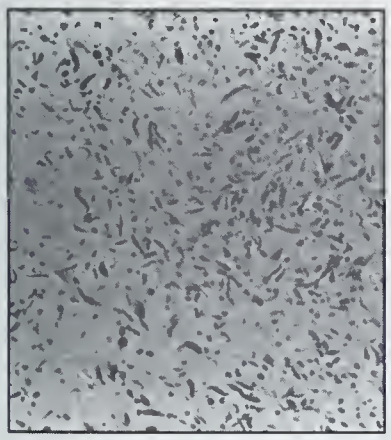

Figure 3a - A low-power view of the alternating loose and dense patterns of the bundles of collagen, Schwann cells, and myxomatous matrix (H & E stain).

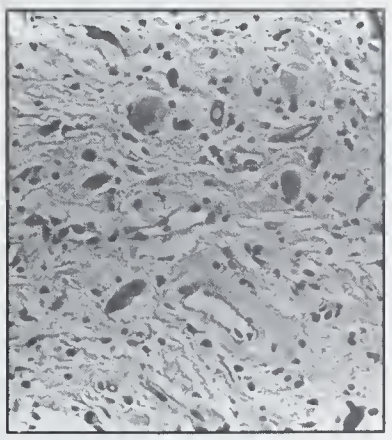

Figure 3b - A high-power view of a neurofibroma showing cellular atypia and vascualr hyalinization (H & E stain).

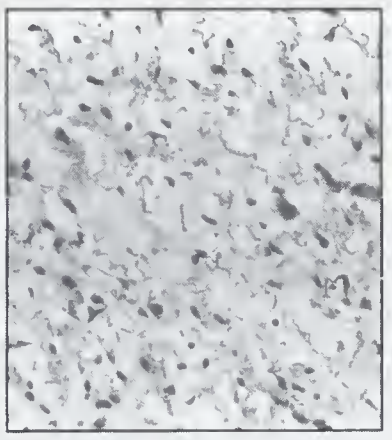

Figure 3c - Neurofibroma showing S-100 positivity.

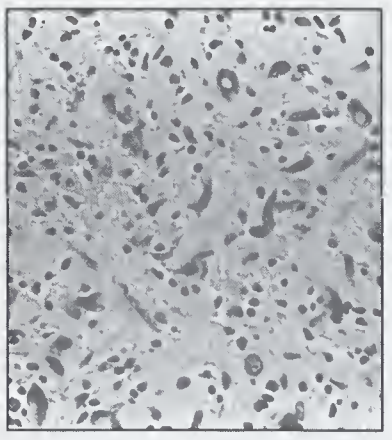

Figure 3d - A high-power view of neurofibroma tissue "lymphocyte-like" cells and mast cells present.

T and B lymphocytes, and macrophages are reliable features of neurofibromas that distinguish them from other Schwann cell tumors. These infiltrative features are exemplified in Figure 3d. It has also been postulated that the mast cells are not only an important cellular marker of neurofibromas, but may also participate in the pathogenesis of these neoplasms[11].

The anti-S-100-protein antibody is used as a marker for the rapid identification of Schwann cell neoplasms[12,13]. The S-100 proteins are calcium binding proteins that may modulate effector proteins similar to the function of calmodulin[14]. Schwann cells, ependymal cells, and astrocytes along with neoplasms derived from these cells have an abundance of the S-100 proteins[12]. Positivity for glial fibrillary acidic protein (GFAP), an intermediate filament, differs between schwannomas and neurofibromas. Schwannomas have a higher incidence of GFAP-positivity than do neurofibromas[13]. The exception to this are schwannomas superficially located in the dermis which tend to be GFAP-negative[13]. Similarly, GFAP-positive neurofibromas tend to be special cases of plexiform neurofibromas situated deeply within the body and not the typical cutaneous variant[13]. Other studies have found GFAP-immunoreactivity to be of little value in distinguishing between well differentiated nerve sheath tumors[12].

Diagnosis

An abundant variety of neoplasms and neoplasm-like lesions may arise in the region of the skull base due to the presence of variable specialized tissues, each with its own associated aberrations. The differential diagnoses of a submandibular swelling includes deep lobe or dumbbell tumors of the parotid gland, thyroid adenomas, lymphomas, tuberculous lymphadenitis, lipomas, brachial cyst, carotid aneurysms, schwannomas, neurofibromas, paragangliomas, neurosarcomas, metastatic carcinomas, and abscesses.

Physical examination using bimanual palpation usually allows the examiner to determine location, extension, consistency, and the distinction of the mass margins . The "bag of worm" sensation on palpation[8] helps to distinguish a plexiform neurofibroma from a schwannoma. Cystic changes within the neoplasm are more indicative of schwannomas than neurofibromas[8]. Auscultation for bruits and neurologic examination for loss of cranial nerve function help to delineate neurogenic tumors from vascular tumors.

A multiplicity of neurogenic tumors involving the face and neck have been readily acknowledged as a stigmata of Von Recklinghausen's disease (VRD) or neurfibromatosis. Further clues to the diagnoses of the systemic disorder are provided by a family history of neurofibromatosis with an autosomal dominant inheritance pattern, the presence of cafe-au-lait spots, and mesenchymal dysplasia of the blood vessels and bones. The reported cases of neurofibroma of the head and neck region associated with VRD have most frequently involved patients in the first, second, and third decades of life[15]. Distinct criteria have been estabilished for the diagnoses of neurofibromatosis so that a single solitary neurofibroma may not represent this disease complex.

The conventional skull radiograph of the head and neck region has frequently proven insensitive to soft tissue masses. However, plain radiographs in conjunction with carotid angiography are extremely important in excluding the possibility of tumor arising from the carotid bodies, particularly with lesions localized in the carotid space. Presently, computerized tomography (CT) with contrast enhancement remains the most readily employed diagnostic imaging technique in visualizing, localizing, and assessing the extent of soft tissue tumors arising in the head and neck region[16]. The appearance of a mass in the submandibular region which is uniformly hypodense relative to muscle and hypovascular is highly indicative of a neurogenic tumor[16].

With the recent evolution of magnetic resonance imaging (MRI), investigators have compared the advantages of using CT and MRI images of the skull base[17]. Due to the inherent superiority of MRI in imaging soft tissues, it has significant advantages over CT in lesion detection and resolution of abnormal and normal tissue margins. Furthermore, large blood vessels are demonstrated better by MRI than CT or X-ray without the use of contrast materials. Currently, the role of MRI in the diagnoses of skull base lesions remains limited by its availability.

In addition to detection and localization of tumors, the assessment of regional spread of the tumor or the staging of skull base cancers have clinical importance in determining the therapeutic management of the patient. In spite of the improved imaging provided by CT and MRI technology, these still do not reveal adequate resolution in qualifying the internal architecture of the lesion[1]. They are, therefore, inadequate in detecting any minimal morphologic changes in lymph nodes with metastatic disease. Furthermore, normal and abnormal nodes cannot be distinguished on the basis of size criteria alone, since the sizes of many occult nodes fall within normal limits[18]. Studies have found that CT and MRI do not have advantages over physical examination in staging metastatic neck disease[18,19]. Therefore, physical examination remains to be the mainstay of staging

disease in the neck, although as high as 50% of positive neck nodes have been missed according to one report[20].

A non-diagnostic fine needle aspiration is typical of benign peripheral nerve sheath tumors. The rarity of positive cytology may be attributed to the adhesive nature of cells in tumors of neurogenic origin. The definitive distinction between schwannomas and neurofibromas is made by histologic examination following peri-operative open biopsy.

Managment

Schwannomas tend to displace nerves and therefore usually allow for surgical resection of the tumor with preservation of the nerve. Neurofibromas, however, incorporate nerves and consequently require an enbloc resection of the tumor and the nerves[9]. In our case study, the neurofibroma apparently emanated from the cervical sympathetic chain adjacent to the vagus nerve. This is consistent with the postoperative development of Horner's syndrome as a consequence of the tumor resection.

As far as we know, there have been no previously reported cases of viable cranial nerve preservation with neurofibromas involving the carotid space. There have been two reported demonstrations of facial nerve preservation following a resection of intraparotid facial nerve neurofibroma[7,8].

Summary

Physical examination and CT scanning with intravenous contrast enhancement are the most useful modalities currently employed in evaluating mass lesions of the skull base. The case study has exemplified the employment of CT in conjunction with carotid angiography in the diagnosis of neurogenic tumors. The nodal involvements of the neck in metastatic disease is primarily determined by size criteria. Physical examination remains to be the method of choice in staging the neck. CT and MRI, however, should not be used for head and neck management decisions since they have not proven to have significant advantage over physical examination in staging metastatic disease. In the majority of cases, fine needle aspiration may not show positivity. Therefore, an excisional biopsy performed peri-operatively is often required. The histologic differentiation of neurofibroma and schwannoma was discussed. Their differences should also be addressed in terms of their malignant potentials and the post-operative maintenance of cranial nerve function.

Acknowlegement

We wish to thank Dr Bedard, chief pathologist of Mount Sinai Hospital, for providing the photomicrographs for this paper.

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Assessing Competency to Consent to Treatment: A Review and Guide

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Abstract

The issue of competency to consent to treatment has received increasing legal and public attention in the past few years as one component of informed consent. Physicians may find it difficult to keep abreast of information pertaining to this topic.

This article focuses on and reviews three aspects of this issue. The ethical dilemmas which face physicians are outlined briefly; legal considerations are evaluated; and aspects of clinical assessment are summarized, including a brief semi-structured interview which can be used for assessment of competency to consent to treatment.

MARC KORKOLA

Introduction

Determining a patient's competency to consent to treatment has become an important issue in the past few years, with the increasing emphasis on patient self-determination and autonomy. Recent and proposed legislation in the Province of Ontario reflects this trend. These changes have already affected the practice of medicine, as many physicians and surgeons now wish to ascertain the competency of their patients to consent to or refuse various procedures and treatments[1]. If a patient is competent, then the physician must get informed consent before administering treatment; if the patient is not competent, the physician must get informed consent from a valid substitute decision maker whenever possible. This article will try to review and elucidate some of the clinical, ethical and legal aspects of this issue which are relevant to practicing physicians.

Problems in Definition

Defining competency is a task that has proven to be difficult, since competency can be set arbitrarily at different levels. In a well-known paper, Roth et al.[2] categorized five levels of competency in order of increasing stringency: 1) the patient evidences a choice (i.e. he or she expresses a wish one way or another); 2) the patient expresses a choice which has a "reasonable" outcome; 3) the patient expresses a choice based on rational reasons; 4) the patient has the ability to understand the information for the decision-making process; 5) the patient understands the information and has the ability to manipulate the information.

Another problem in defining competency is that it is a general term which covers a number of different situations, including competency to manage one's own finances, to care for oneself or to consent to participate in research. In fact, the list is almost infinite, since any decision by the patient about his or her life requires competency. At the same time, it is important to realize competency is issue-specific, (i.e. if the patient is found to be incompetent in one area, it does not mean that he or she is incompetent in any other area). This implies there is no general test for competency, and each type of competency must have its own criteria and be tested

according to the specific issues at hand. Consequently, not only has there been no universally agreed upon definition of competency, but it seems likely that it will be very difficult if not impossible to arrive at one in the future.

Ethical Considerations

Why has this topic been propelled to the forefront of medical debate? An important factor has been the growing concern over the ethical conduct of those in the medical profession. Two major ethical principles are at odds in the issue of competency: the principle of beneficence, or promotion of the well-being of another person, and the principle of autonomy, or self-determination by the patient.

Traditionally, a paternalistic view of medicine held that physicians would do what is in the patient's best interest, and that a patient's informed consent was not required in patients who, because of age or infirmity, had questionable competency. Over the past few decades, the growing emphasis on patient autonomy has challenged that view. In Western society, one of our most fundamental values is individual freedom, and this includes having the right to be an active participant in decisions that affect one's health. However, patient participation pre-supposes a capacity for such acts and the patients' ability to assume responsibility for their decisions[3]. To respect such expressions of freedom without considering the patient's competence would disregard professional and public expectations that a physician consider the overall health of the patient.

The recent Quebec court decision concerning Nancy B. has demonstrated the concept of a competent patient's autonomy. This young woman was suffering from chronic Guillain-Barre syndrome, which permanently confined her to a bed on a life-support system. Her initial request to disconnect her life-support was denied by her physician. However, the court ruled in her favour, citing her right as a competent individual to decide on her options for treatment.

Legal Considerations

Legal factors have also played a role in making competency a significant issue. Canadian law requires that competent patients provide consent to any treatment or procedure performed by a health professional. An exception to this requirement is in initiating emergency treatment for an unresponsive patient, unless the patient when competent has given an advance directive prohibiting the recommended treatment[4]. Although consent may be explicit or implied, if it is not present the physician may be sued successfully for assault and battery.

Informed consent is a broad topic beyond the scope of this paper but has been discussed at length elsewhere[5-8]. Briefly, a valid consent has three essential attributes:

1) The consent must be informed. The physician is required to disclose to the patient those risks, benefits and alternatives that the average person in the patient's situation would find relevant in making the decision to agree to or refuse treatment[9]. The physician must also answer any questions the patient has. When providing information to the patient, it is essential the language used be appropriate to the patient's educational and cultural background.

2) The consent must be voluntary, given without even subtle coercion.

3) The consent must be accepted only from a patient who is deemed competent. From a legal, as well as a clinical point of view, patients over the age of 16 should be assumed to be competent unless proven otherwise. Many patients under the age of 16 years are clinically competent to make decisions about medical and surgical treatment although Canadian laws are quite variable in recognizing this.

The Province of Ontario has been a leader in introducing legislation concerning competency to consent to psychiatric treatment. Legislation already in effect has firmly secured the right of a fully competent patient to refuse treatment[9]. Refusal of treatment can no longer be overridden by a review board or the courts if the patient is deemed competent. Legislation recently proposed by the Ontario Government would further codify and clarify competency and how it relates to all health care practitioners[10].

The cornerstone of the proposed legislation in Ontario, however, appears to be the principles contained in the amended Mental Health Act (MHA). This act uses a relatively high standard of competency. There are four basic criteria which the patient must pass in order to be deemed competent[11]:

The patient must understand: 1) the nature of the illness for which the treatment is proposed and 2) the nature of the treatment which is being recommended. As well, the patient must appreciate: 3) the consequences of consenting to the treatment and 4) the consequences of refusing treatment. The use of the words "understand" and "appreciate" is important here. "Understanding", as applied to the first two criteria, refers to those elements of competency that are purely cognitive. The word "appreciate" implies that for the last two criteria, a mere factual understanding of the situation is not enough, and

the patient must be able to rationally manipulate the information and apply it to his or her own situation.

In Ontario, the recent Enquiry on Mental Competency (Weisstub Commission)[12], as well as the recently introduced Consent to Treatment legislation[10] have each used similar and strict definitions of competency to consent to health care. It must be noted, however, it is only for psychiatric treatment that competency has been legally defined. Other areas of medicine await future legislation.

It is also worth noting that there is no legal relationship between the concepts of competency to consent to psychiatric treatment and involuntary commitment to a psychiatric unit which is based on a dangerousness standard. In law, the involuntary patient may be competent or incompetent to consent to treatment.

Clinical Assessment

In spite of the recent interest in the issue of competency, very few specific clinical tests have been developed to evaluate a patient's competency to consent to treatment[13, 14]. The existing guidelines lack wide clinical use at this point, leaving physicians on their own to assess the patient for the required criteria. In this situation, a cursory mental status examination may take the place of a formal test of competency, or the patient may be referred to a psychiatrist. In fact, there has been a marked surge recently in requests for psychiatric consultations for competency evaluations of physically ill patients[15].

A semi-structured interview in the form of a questionnaire has recently been developed in an effort to give physicians a standardized tool with which they can easily, accurately and reliably evaluate competency to consent to treatment. This interview was developed using the only existing formal guidelines for competency in Ontario - the MHA - but its use may be broadened to include competency for medical treatment as well. Although the test has to be formally evaluated for validity and reliability, this short questionnaire comprehensively covers the four criteria required legally by the MHA and the proposed legislation in Ontario for competency to consent to treatment. It uses simple and clear language so that it can be administered without difficulty to most patients. The questionnaire can be modified so the interviewer uses language appropriate to the educational and cultural background of the patient.

The interviewer should record the patient's verbatim response to each question, as well as any relevant observations made during the interview[14]. If an initial response by the patient does not clearly indicate competency, it must be established that this is not due solely to a lack of knowledge or language difficulties. This is done by providing the patient with appropriate information, and then repeating the question and giving the patient an opportunity to show his or her ability to understand and appreciate the relevant issues. The patient must be asked about each illness and treatment as the patient may be competent regarding one illness or treatment but not another.

A: Understanding the nature of the illness

1. Could you tell me why you are here?

2. Do you believe you have any physical or emotional problems?

3. List the symptoms or behaviour that your doctor is recommending treatment for.

4. Tell me the name of the illness for which your doctor is recommending treatment.

B: Understanding the nature of the treatment

5. What is the role of the doctor while you are in the hospital?

6. What treatment is being recommended?

7. Why is this treatment being recommended?

8. Tell me what you understand about the nature of this treatment.

9. Do you think you need this treatment? Do you need any treatment/help?

C: Appreciating the consequences of consenting to treatment

10. Tell me any possible benefits for you in consenting to this treatment. How might this treatment help you?

11. Tell me any possible risks for you in consenting to this treatment.

D: Appreciating the consequences of refusing treatment

12. Tell me any possible benefits for you in refusing this treatment.

13. Tell me any possible risks for you in refusing this treatment. Tell me these risks for you.

Discussion

It must be noted that competency is an attribute that fluctuates with the mental state of the patient. Time and place of each assessment should be recorded since the mental state may change with time[14]. During periods of competency, the patient may make decisions about the treatment they wish to receive during a later period of incompetency[14].

Patients should be informed they are being assessed for competency to consent to treatment. If a patient refuses to co-operate with the assessment, the findings may be inconclusive or based on inferences from other observations of the patient[14]. The finding of incompetency in such cases must be made carefully, since the patient may have valid reasons for not co-operating, such as anger or language difficulties. A physical condition such as a stroke with an expressive aphasia may also contribute to the inability to co-operate with an interview even though the patient is competent[16].

Which patients are likely to be assessed for competency? In the past, the majority have been psychiatric patients. It has been assumed these patients are incompetent to make decisions about their own treatment. Although the majority of patients who are evaluated for competency do have psychopathology[17], clinical evidence suggests that despite alterations in thinking and mood, psychiatric patients are not automatically less capable than others in making health-care decisions[18]. For example, schizophrenic inpatients did not differ substantially from medical inpatients in their knowledge of medication [19, 20]. Hospitalized psychiatric patients and medical patients evaluated the risks and benefits of proposed research projects in a similar manner[21]. The onus is therefore on the physician not to assume incompetency, but to conduct an assessment that is objective and nonjudgmental. In the future, a wider range of patients will have to be assessed for competency including nursing home residents, geriatric patients and neurology patients. Virtually every unit and physician will have some patients with questionable competency.

What happens when a patient is found to be incompetent? The MHA of Ontario, as well as new legislation proposed in Ontario for most health-care workers[10] provides a strict hierarchical list of substitute decision makers and procedural and legal safeguards when a patient is declared incompetent by a physician[22]. These include notification of the patient of the finding of incompetency, the right to appeal the finding, a rights

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adviser contacting the patient and the need to get an informed consent from the legally mandated substitute decision maker. Physicians will have less authority to act paternalistically even on geriatric wards or in nursing homes. Once the consent of the substitute decision maker is obtained, the patient can then receive treatment. Under the current MHA, patients can be treated for their psychiatric conditions but there is no legislation to authorize the non-emergency treatment of the incompetent medically ill patient. With the proposed legislation, the patient could be treated for both the psychiatric and physical illnesses.

Case Illustration

To demonstrate some of the above points involved in assessing competency to consent to treatment, a brief, hypothetical case study is presented here. A case such as this would be typical in the setting of a general hospital.

A 55-year-old, married male presented to hospital, complaining of a 4-month history of abdominal pain. The patient also had a history of irritability, decreased concentration, terminal insomnia, weight loss and anhedonia (loss of interest in pleasurable activities) over the same period.

Upon physical examination, a hard, well-circumscribed mass was found in the lower abdomen. It was suspected the patient had an abdominal tumour, possibly carcinoma of the pancreas, and immediate investigation to establish the diagnosis was recommended. The patient refused. Upon further questioning, the patient revealed an unshakable fear and belief that the intestine contained worms which might be released if anything were done to the abdomen. After being told such a scenario was impossible, and receiving correct information about the potential benefits as well as potential problems relevant to the recommended procedures, the patient still adamantly refused to consent to the investigative procedures.

A psychiatric consultation was obtained. It was suspected the patient was suffering from depression with delusional features, especially since it is known that tumour of the pancreas may present with a full range of depressive symptoms[23].

Regarding his psychiatric condition, the patient did not have the ability to understand he had a psychiatric condition; nor did he appreciate the benefits of receiving treatment or the risks of refusing. From a medical point of view, he knew he had an abdominal condition but could neither understand its nature nor appreciate the consequences of giving or refusing consent. It was recommended the patient be deemed incompetent to consent to medical treatment, since he was unable to understand the nature of his illness, and could not appreciate the consequences of giving consent for treatment after being provided with appropriate information. The patient's wife was then asked to become a substitute decision maker for her husband, as she was the highest ranking family member listed in the MHA. She had been following her husband's progress closely, was quite concerned and was co-operative with hospital staff. She was informed in detail about her role, and was able to give consent on her husband's behalf to treatment of his depression with anti-depressants.

Under a strict interpretation of the current law in Ontario, the patient's wife can only consent to investigation and treatment of the patient's psychiatric condition. Under new and proposed legislation in Ontario, this would change so that the wife could consent to the investigation of both medical and psychiatric conditions.

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Summary

As a key element of informed consent, competency to consent to treatment has received much publicity in both the lay and the medical literature, but little concrete research has been done on the topic. It is imperative the definition of competency be operationalized[22], so that a standardized, consistent approach to assessment can be taken.

Once that is accomplished, the next step is to consider how incompetent patients can communicate their wishes about health care. Possibilities include proxy decision-making or using a living will. Current laws will have to be broadened and new laws formulated to establish precise guidelines for these options. In doing so, ethical principles, legal issues, as well as clinical realities must be taken into consideration. Although not an easy task, being aware of the complexities of this issue will assist physicians in offering better patient care.

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A Comparative Review of Goretex and Iliotibial Band Replacement for ACL Insufficiency

Richard Kaminker, 9T3

Abstract

A comparative review of twenty cases of surgically reconstructed anterior cruciate ligament (ACL) insufficient knees was conducted. The retrospective study consisted of ten patients who underwent operative ACL reconstruction using a Goretex synthetic ligament and ten patients who were treated with a replacement consisting of a strip of autogenous iliotibial band.

Patient follow up occured at a mean of 42 and 44 months for the Goretex and iliotibial band groups respectively.

A combination of chart review, questionnaire, and clinical exam was used to asses rehabilitation time, post operative activity levels, stability, and complications for each patient.

The results indicated that although both groups were able to achieve similar post operative activity levels, the Goretex group returned to activity significantly earlier than those treated with an iliotibial band replacement.

Of importance is the higher complication rate associated with the Goretex implant. Partial tears of the graft developed in three patients. Effusions occured of significant severity requiring arthroscopy which revealed partial tears and fibrotic graft particles within the joint.

There was no significant difference between the two groups in the patient's subjective evaluation or with orthopaedic clinical examination of joint stability.

In conclusion, the possibility of graft rupture exists in individuals treated with a Goretex ACL replacement who participate in activity that is stressful on the ligamentous structure of the knee (i.e. pivoting type sports such as basketball). Therefore, the Goretex replacement should be restricted to those symptomatic individuals who cannot tolerate a long rehabilitation period, and are not involved in agressive activity that may compromise joint stability. The lack of tears associated with the iliotibial band replacement do not restrict its use based on the type of activity participated in by the patient.

Introduction

ACL insufficiency is one of the most common and incapacitating injuries of the knee, resulting in its decreased stability and function. The most common mechanism of injury occurs during pivoting type activity. The foot is planted, knee extended and quadriceps contracted while a force rotates the tibia internally on the femur (figure 1). As the ACL is torn, an audible "pop" with the sensation that the knee "gave out" is often experienced by the patient. The knee then develops a rapid haemarthrosis[2,8].

Surgical reconstruction is considered in the patient who is unable to compensate without an ACL and presents with an unstable knee. In these cases, the ACL insufficient knee will present with episodes of "giving way", which is described as the sensation that the knee is about to buckle or collapse due to feelings of instability. This is followed by swelling, pain and functional disability.

The patient with an unstable knee becomes restricted in his/her ability to participate in activity such as sport or

Figure 1 - Patient reproduction of exact mechanism of injury: the extended knee, internal rotation of the tibia on the femur, a loud pop, and a sensation of something "giving way" in the knee.

Figure and caption reproduced from Arnold's, Natural history of anterior cruciate tears'.

heavy work requiring pivoting, rapid changes of direction, walking on uneven ground, or jumping. If such restriction of activity is not tolerated by the patient, surgical reconstruction is indicated. Clinically, a positive Lachman, Anterior Drawer, or Pivot Shift sign reflect the instability of a knee that lacks its ACL[1,2,6,8,11,15].

The ultimate goal of reconstructive surgery is to improve knee stability so the patient can return to his/her normal activity level. Two methods of surgical reconstruction include 1) a synthetic Goretex graft and 2) the use of a strip of the patient's own iliotibial band.

The past fifteen years have seen an increased interest in the use of artificial ligaments, such as Goretex graft, for ACL replacement in the hope of saving autogenous tissue and allowing rapid rehabilitation. However there have been reservations expressed concerning the use of an intra-articular synthetic ligament. It is questionable whether a synthetic graft without the same biomechanical properties as autogenous tissue could withstand the forces applied to the ACL. Synthetic graft particles have also been shown during in-vivo and in-vitro studies to induce an inflammatory response. Such a response could promote episodes of both acute synovitis or long term osteoarthritis of the knee. The ligament itself is constructed of three bundles of polytetrafluoroethylene , and the biocompatibility of this material has been demonstrated by its use in vascular grafts over the past twenty years[4,10].

Historically, MacIntosh[4] was the first to describe an extra-articular reconstruction of the ACL using the iliotibial band in the "over the top" position of the lateral femoral condyle. Since that time the technique was modified, as in this study, to include passage of the band through the intercondylar region of the knee.

Methods

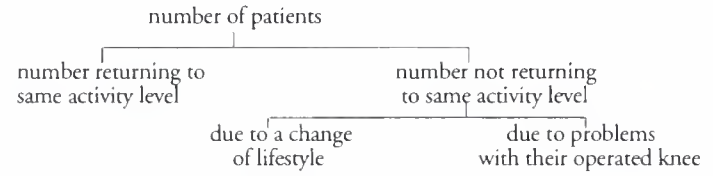
The following four parameters were selected to objectively and subjectively evaluate the patient's knee function, stability, and complications since surgery.

1. Activity Rating

i) A combination of chart review and interview were used in order to determine the amount of rehabilitation time required for patients to return to ambulation with full weightbearing post-operatively.

ii) The patient's ability to return to similar types of activity as participated in prior to injury was analyzed as illustrated below.

Figure 4: **Activity Rating Chart**


number of patients
number returning to same activity level
number not returning to same activity level
due to a change of lifestyle
due to problems with their operated knee

2. Patient's Subjective Evaluation

A questionnaire developed by Noyes et al.[13] in 1985 was modified for subjective assessment. The questionnaire was divided into three parts dealing with symptoms of pain, swelling, and instability. Each response was scored out of a maximum of ten. (see tables 2,3,4).

3. Orthopaedic Clinical Examination

The knee of each patient was examined and scored according to to the Anterior Drawer and Lachman tests of knee joint stability (see tables 5,6).

Figure 2 - Lateral substitution over the top (LSOT) - Iliotibial band ACL reconstruction

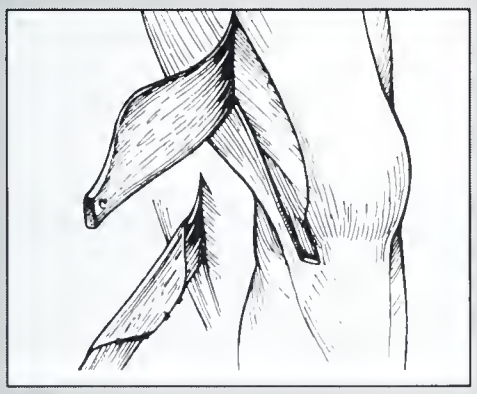


Figure 2a

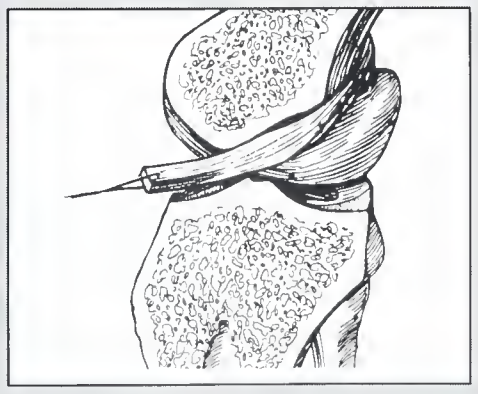


Figure 2b

Figure 2c

2a. Excision of appropriate size graft from the iliotibial band 2b. After suturing the graft to the lateral collateral ligament, it passes from 'over the top' space of the lateral femoral condyle, through the inter-ondylar notch 2c. The graft has been passed through a tibial drill hole and sutured to sub-periosteal tissue. A full length leg cast is applied after operation for a duration of three weeks. Physiothe-rapy begins after cast removal

[modified from Insall,[9] (2a,2b) and Hefti,[7] (2c)]

Figure 3 - Goretex-ACL reconstruction

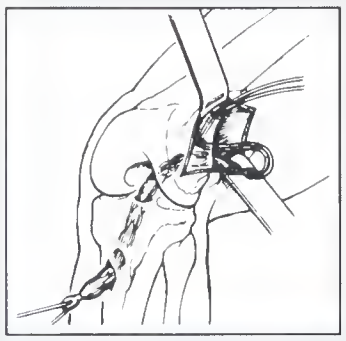


Figure 3a

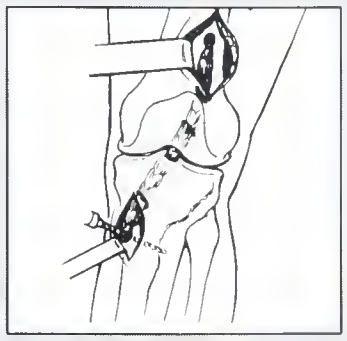


Figure 3b

3a. Two drill holes have been made for passage of the artificial ligament i) from medial to pateller insertion into the intercondylar region ii) from supralateral femoral condyle, passing through the condyle obliquely to enter the intercondylar notch

3b. The ligament has been passed through both bony tunnels. Bicortical screws are drilled through the graft islets for fixation to tibial and femoral ends. In contrast to the iliotibial band replacement, casting is not required. The patient leaves hospital with partial weightbearing on crutches until he/she can ambulate without much pain

[3a and 3b modified from Friedman,[3]]

4. Complications

Each patient's chart was reviewed for complications that developed after the time of surgery, including : infection, arthroscopic debridement, tearing of the surgical graft, recurrent effusions, DVT.

Results

The Goretex group had a mean age of 33.8 years (range 23-51) and a mean follow up of 42.0 months (range 27-52) after surgery. The iliotibial band group had a mean age of 27.9 years (range 19-49) and follow up of 44.4 months (range 32-59).

Arthroscopic examination under anaesthesia was used to confirm the diagnosis of a torn ACL. Four Goretex patients and three patients treated with the iliotibial band reconstruction had medial meniscal tears requiring partial menisectomy prior to ACL replacement. There were no associated fractures or ruptures of the collateral ligaments in any of the patients.

The two groups were also compared with respect to their pre-injury activity levels (table 1).

Table 1

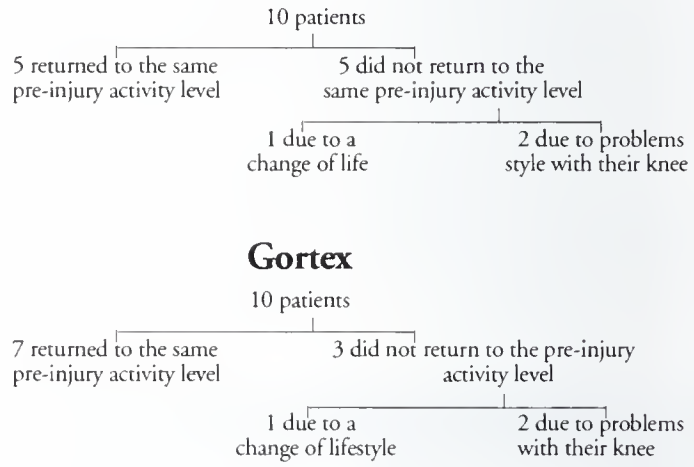
Preinjury activity level	Iliotibial Band (# of patients)	Gortex (# of patients)
I. Recreational sport participation less than or equal to once a week.	1	3
II. Recreational sport participation greater than once a week / heavy physical work (i.e. construction)	6	7
III. Regularly competes in formal type events.	3	---

Overall, the Goretex group tended to be older and less active prior to injury than the iliotibial band patients.

1. Activity Rating

The Goretex group of patients were able to return to full weightbearing during ambulation at a mean of 1.8 weeks compared to the 8 week time period required by the iliotibial band group. ($p<0.01$ - t test).

Figure 5: **Activity Rating Charts**


Iliotibial band
10 patients
5 returned to the same pre-injury activity level
5 did not return to the same pre-injury activity level
1 due to a change of life
2 due to problems style with their knee
Gortex
10 patients
7 returned to the same pre-injury activity level
3 did not return to the pre-injury activity level
1 due to a change of lifestyle
2 due to problems with their knee

Make your move.

Badminton's easy and exciting!
After work or on the weekend,
make it part of your game plan!

PARTICIPACTION ®

2. Patient's Subjective Evaluation.

Table 2: Pain

Score	Iliotibial Band (# of patients)	Goretex (# of patients)
10	5	3
8	1	1
6	2	4
4	1	1
2	1	1
0	---	---
average score	7.6/10	6.8/10

(p>0.05 ANOV)

PAIN:
10 I experience no pain in my knee.
8 Occasional pain with strenuous sport or heavy work.
6 Occasional pain with light sport or moderate work.
4 Frequent pain with light sport/moderate work, or occasional pain with walking.
2 Pain is a problem with activity as simple as walking, but relieved by rest.
0 Pain at all times. Not relieved by rest.

Table 3: Swelling

Score	Iliotibial Band (# of patients)	Goretex (# of patients)
10	6	5
8	2	3
6	1	1
4	---	---
2	1	1
0	---	---
average score	8.4/10	8.2/10

(p>0.05 ANOV)

SWELLING:
10 No swelling of my knee occurs.
8 Occasional swelling with strenuous sport or heavy work.
6 Occasional swelling with light sport or moderate work.
4 Frequent swelling with light sport or moderate work.
2 Swelling occurs with simple activities such as walking, but is relieved by rest.
0 Severe swelling limits simple activities such as walking.

Table 4: Stability

Score	Iliotibial Band (# of patients)	Goretex (# of patients)
10	8	8
8	---	1
6	1	---
4	---	---
2	1	1
0	---	---
average score	8.8/10	9.0/10

(p>0.05 ANOV)

STABILITY:
"Giving way" is the sensation that the knee is about to buckle or collapse due to feelings of instability within the knee.
10 I have not experienced any giving way of my knee ince surgery.
8 My knee has not given way since surgery, but feels like it might with excessive pressure or twisting.
6 My knee gives way occasionally with light recreational activity. I am able to compensate, but it does limit vigorous activity.
4 Giving way limits sports and moderate work.
2 My knee gives way with simple activity such as walking. I always guard the knee.
0 I cannot turn or twist while walking without my knee giving way.

3. Orthopaedic Clinical Examination

Table 5: Anterior Drawer Test

Classification of instability	Iliotibial Band (# of patients)	Goretex (# of patients)
Stable (9 pts)	7	5
I. Sligth, distinct end-point (6 pts.)	2	5
II. Obvious, without distinct end-point obvious	1	---
III. Gross, tendency to subluxation (0 pts.)	---	---
average score	7.8/9	7.5/9

Table 6: Lachman Test

Classification of instability	Iliotibial Band (# of patients)	Goretex (# of patients)
Stable (9 pts)	6	5
I. Sligth, distinct end-point (6 pts.)	3	5
II. Obvious, without distinct end-point obvious	1	---
III. Gross, tendency to subluxation (0 pts.)	---	---
average score	7.5/9	7.5/9

4. Complications: None of the patients treated with an iliotibial band replacement developed any complications according to the categories investigated.

Complications were noted in four of the ten patients in the Goretex group postoperatively. One patient developed a cellulitis over the anchoring screw that required screw removal. Three patients developed secondary complications due to partial tearing of the graft. In each case effusions occured of significant severity and duration to warrant arthroscopic examination that revealed the following:

Patient 1 -a 50% tear of the graft requiring debridement
Patient 2 -irrigation of haemorrhagic and fibrotic particles from the joint
Patient 3 -a 10% tear of the graft requiring debridement
After arthroscopic debridement, no further effusions occured in any of the patients.

Discussion

In this study, the Goretex group of patients were able to return to activity earlier than those patients treated with an iliotibial band replacement. The average amount of time until return to full weightbearing during ambulation was 1.8 weeks for patients treated with a Goretex graft. These findings are consistent with those of Glousman et al5 in a study of eighty two patients at an average follow up of eighteen months. Glousman reported an average return to activities of daily living within three weeks.

The longer time needed for iliotibial band treated patients to return to activity (weightbearing 8 wks.) is related to the nature of the iliotibial band surgical procedure and post operative management. The surgical dissection of a piece of iliotibial band necessitates casting in order to protect and promote soft tissue healing. During this time the autogenous reconstruction goes through a period of weakness associated with revascularization of the graft[14].

Immobilization of the joint prevents the opportunity for further trauma which could rupture the weak graft at this time. When the cast is removed, after three weeks in this study, the knee is left with some residual stiffness which adds to the delay in return to activity. However, it should be noted that the amount of time required for casting is controversial. In fact, in a study of twenty four knees treated with a similar operation conducted by Insall et al[9],

only a Jones type dressing was applied post- operatively. These patients returned to activity at similar rates as patients treated with Goretex graft in this study as most were able to weightbear without crutches in three weeks.

Both groups of patients had similar abilities to return to the types of activity they participated in before their injury occured. In each case, as demonstrated by the activity rating charts, twenty percent could not return to earlier activity levels due to problems with their knee.

Therefore, although patients treated with a Goretex replacement returned to activity earlier than those treated with an iliotibial band replacement, both groups had the same ability to eventually achieve pre-injury activity levels.

There were no complications associated with the iliotibial band replacement compared to the partial tears that occured with the Goretex graft. Three patients developed serious enough effusions to warrant arthroscopic examination and debridement of graft particles.

The effusions associated with partial graft tearing are consistent with the complications noted in other studies that used a Goretex replacement. Of the eighty two patients studied by Glousman[5], there were four total ruptures and four sterile effusions associated with partial attenuation of the graft. In a study of one hundred and thirty two patients with an average follow up of thirty four and a half months, conducted by Johnson[10], there were six re-implants for failures, and fifteen effusions within six months after operation that responded to Indocid.

A study by Olson[14] examined the effects of graft particles, including Goretex, in vivo. A foreign body response was produced that included hypertrophy of synovium, and macrophage infiltration. A release of mediators such as IL-1, PGE-2, and neutral proteinases occured and was responsible for the effusions.

The subjective results indicated no statistical difference in the amount of pain or swelling experienced by the two groups after arthroscopic debridement of those Goretex replacements which had partial tears.. There was also no difference between the two groups in terms of stability, both subjectively and with Anterior Drawer or Lachman tests. These results accompanied by the similar ability to achieve levels of activity participated in prior to injury imply that the the partial tears of the Goretex ligament did not affect the stability of the knee. However, there is the possibility that tears could progress to complete ruptures if stressed enough by higher levels of activity.

Conclusions

Patients treated with Goretex graft return to activity earlier than those treated with iliotibial band replacement due to the soft tissue dissection and casting associated with the iliotibial band replacement. Both groups had similar ability to return to pre-injury levels of activity. The complication of effusions secondary to partial tears of the graft occured only with the Goretex group. Effusions did not return after arthroscopic debridement of partially torn grafts, resulting in no difference between the two groups subjective evaluation of pain and swelling. Subjective evaluation and orthopaedic clinical tests showed no difference between the two groups knee stability.

Although patients treated with a Goretex graft return to activity earlier, tearing of the graft is more likely to occur in patients treated with a Goretex than iliotibial band replacement. Therefore, the Goretex graft should be limited to the less active individual who places less demand on his/her knee and cannot tolerate a long rehabilitation time. Compared to the Goretex replacement, the iliotibial band reconstruction need not be restricted to less active individuals.

Acknowledgement

The author would like to thank Dr. Michael West, orthopaedic surgeon, who provided supervision and guidance for this project.

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Manuscripts should be typed double-spaced, on paper approximately 22 X 28 cm. All submissions should be no longer than 4000 words or about 16 double-spaced typed pages with a maximum of 3-4 figures (graphs, tables, line drawings, photographs). Shorter papers are preferred. Pages should be numbered consecutively starting with the title page, which should include the authors' full names, most recent degrees and affiliations. The title page should be the only one with the authors' names on, and should indicate **exactly** how the names are to appear. To facilitate the doubly anonymous peer review process, do not have the authors' names on pages other than the title page, fully label only one set of illustrations (label the other sets with numbers only), and place acknowledgements on a separate page.

Abstract - An abstract of not more than 200 words, typed on a separate page, is required for each article or note. No abbreviations should appear in the abstract. A translation of the abstract into French, if possible, should be included (abstract only).

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The reference list should be placed at the end of the text beginning on a separate sheet and should be listed with the arabic numeral following the order of appearance in the text. Journal article references should correspond to the following style:

You Ch, Lee Ky, Chey Wy, Menguy R. Electogastrographic study: a patient with unexplained nausea, bloating and vomiting. Gastroenterology 1980; 79:311-314.

For further details, see CMAJ 1985;133:443-448.

Tables - Tables should be numbered with arabic numerals, have a brief title, and be referred to in the text. Column headings and descriptive matter in tables should be brief. Vertical rules should not be used.

Illustrations - Each figure should be planned to fit into the area of either one or two columns of text. Photographs and illustrations must be black and white and of good quality. Colour will only be considered if the author, or an outside sponsor, is willing to pay the cost. The figures (including halftones, photographs) are numbered consecutively in arabic numerals, and each one must be referred to in the text as well as being self-explanatory. Only essential labelling should be used with detailed information given in the caption. Letters and numerals should be of such size that the smallest character will not be less than 1 mm high when reduced.

Drug Names -Both nonproprietry (generic) and trade names should be provided for all drugs mentioned.

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Publication deadlines are September 15, November 15 and January 15. Papers which are submitted earlier will receive greater consideration.

Annual Student Research Day: A Look at Future Clinician-Scientists

C.I. Whiteside, MD, PhD, FRCP(C)

Co-ordinator, Undergraduate Research Day

Six years ago, the undergraduate medical student research day was initiated by a second year medical student who felt that undergraduates engaged in clinical and basic research should have an opportunity to display their accomplishments. The process continues to evolve and change in format from year to year, but is becoming an important tradition.

This year over fifty students presented outstanding poster displays describing their research in areas such as behavioural science, biomedical engineering, molecular genetics, cell biology and physiology, to mention only a few. All students who participated received a full elective credit. Those eligible for the cash awards included students who had completed all of their work during medical school years, independent of graduate studies.

The top two prize winners, Babak Jaharmi and Lawrence Weisbrod, were invited to attend the U.S. Annual Medical Student Research Forum in Galveston, Texas (April 2-4, 1992) where they will present their research posters.

Special thanks is extended to the judges: Dr. Patricia Stewart (Department of Anatomy and Cell Biology), Dr. Karl Skorecki (Department of Medicine/Nephrology), Dr. Maria Bacchus (Department of General Internal Medicine).

The quality of the research presentations was uniformly outstanding. All of the staff who attended, including many of the students' research supervisors, stated that the quality was as good or better than that of many of the presentations at scientific meetings that they attend. I was particularly impressed with the enthusiastic and collegial interaction among the students themselves.

Following the poster presentation, Professor Michael Bliss addressed the students and staff with a remarkably enlightening and entertaining talk about the discovery of insulin by Banting and Best. We were reminded that the pathway to scientific discovery is frequently complicated by discouraging setbacks. However, the story of the discovery of insulin reaffirms that courage, patience, hard work and collaborative efforts lead to success and sometimes great contributions to medical practice.

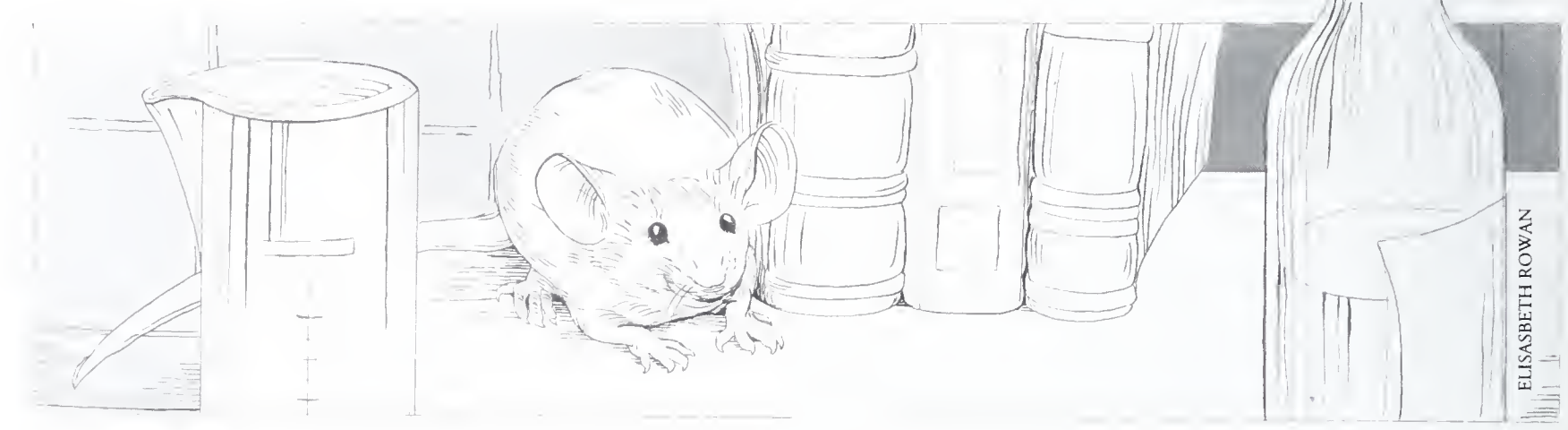
At a wine and cheese reception, the winners of this year's cash prize competition were announced. Graduates and non-graduate students competed in separate categories. Congratulations to all the winners and participants of this year's Student Research Day. We are extremely proud of your achievements and hope that you will continue to enjoy research endeavours as part of your career development.

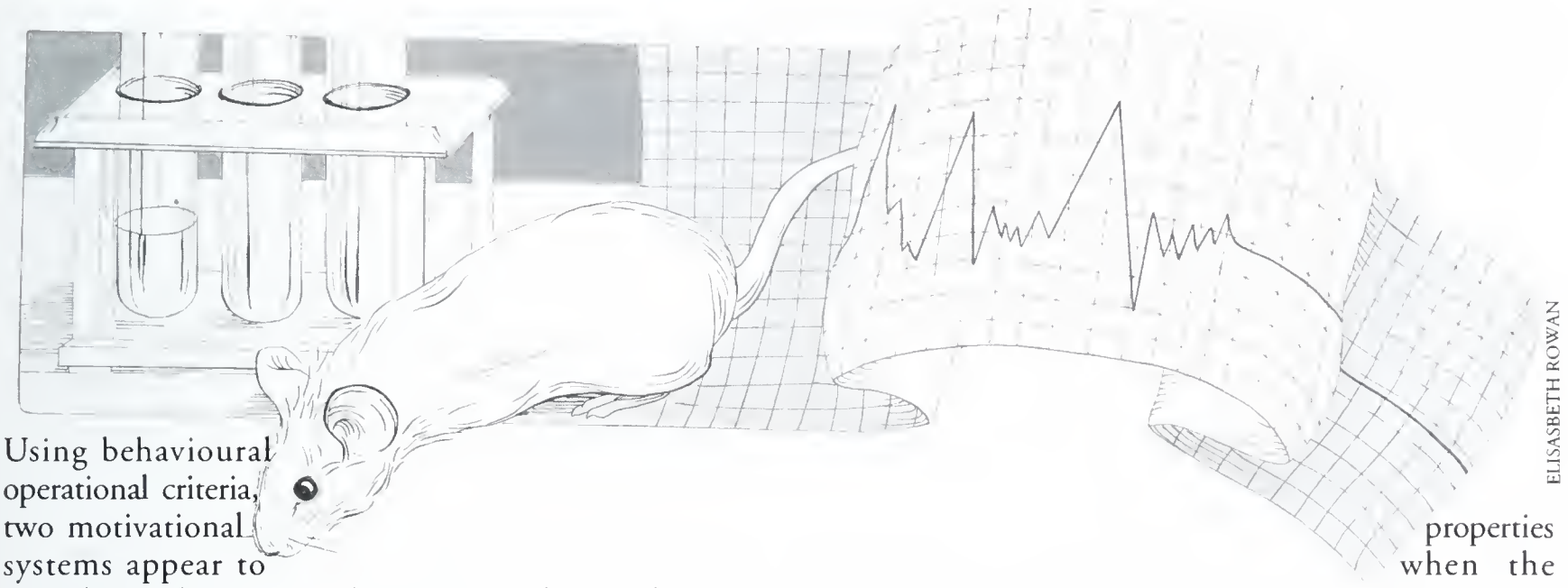
Basic Science Category

Graduate Students	Non-Graduate Students
1st - Taresa Stefuak,	1st - Babak Jahromi
2nd - Victor Sauro	2nd - Janet Huang

The role of the TPP nucleus in saccharin unconditioned and conditioned effects.

T.L. Stefurak B.Sc. M.Sc. and D.van der Kooy Ph.D Neurobiology Research Group, Dept of Anatomy, University of Toronto.





ELISABETH ROWAN

Using behavioural operational criteria, two motivational systems appear to stimulate behavior: i) a homeostatic drive-reduction system where an animal acts to reinstate a homeostatic imbalance and ii) an incentive motivation system where behaviour reflects the inherent motivational quality (reward or aversiveness) of stimuli. How these motivational systems interact in daily behaviours, such as feeding, and the neural basis of these systems is still under investigation. In a recent study, lesions of the tegmentem pedunculopontine nucleus (TPP), a termination nucleus of efferent fibers from the limbic area located in the medial forebrain bundle, abolished the incentive motivational properties of opiates, amphetamine and food in a deprivation state dependent manner. This study investigated the possible role of the TPP neural system as a putative mediator of the rewarding motivational properties of saccharin's sweet taste in both conditioned and unconditioned behavioral paradigms. Simple consumption monitoring techniques showed uniform large differences in consumption activity in day versus night regardless of lesion groups, however there were significant differences between SHAM- and TPP-lesion groups' saccharin consumption during daytime (nonprandial) periods. During these periods, hypothetically presumed to be a period when the incentive system is dominant, TPP-lesioned subjects did not exhibit saccharin preferences over water. TPP-lesioned animals did not show saccharin conditioned place preference effects, whereas conditioning of SHAM-lesioned subjects revealed strong learned assocaitions between places and saccharin reward. Saccharin's memory improving abilities, previously suggested not to act through saccharin's motivational effects, remained intact after TPP lesions. We suggest that the TPP system appears to mediate the rewarding motivational effects of saccharin required for unconditioned and conditioned saccharin preferences, but not saccharin's memory improving effects. Given the multimodal spectrum of rewarding stimuli that apparently lose their rewarding properties when the TPP system is interrupted, this nucleus may be involved in a common neuroanatomical "pleasure" pathway. The major implications of defining a common "pleasure" pathway, as such, may include contributing to the functional map of the brain and providing an investigative tool to study the role of the incentive system in daily behaviour, as well as learning and memory.

Signal transduction during L6 skeletal myogenesis.

V.S. Sauro and K.P. Strickland, Dept. of Biochemistry, University of Western Ontario

During skeletal myogenesis, mononucleated myoblasts fuse to form multinucleated myotubes representative of a rudimentary muscle fibre. It has been proposed that receptor-mediated PtdInsP2 (phosphatidylinositol-4,5-bisphosphate) breakdown may play a critical role in the mechanism of myoblast fusion. This study demonstrates that both calcium influx and PtdInsP2 breakdown occur prior to rat L6 myoblast fusion. However, our results suggest that calcium influx is likely responsible for the PtdInsP2 breakdown observed during calcium-regulated myoblast fusion. Enhanced PtdInsP2 turnover in fusion-competent myoblasts may serve to maintain a high degree of mambrane-associated PKC (calcium and phospho-lipid-dependent protein kinase) activity. The PtdInsP2-specific phospholipase C is likely down-regulated following myoblast fusion, and may account for the oberserved decrease in membrane-associated PKC activity noted in myotubes. PKC is shown to activate a PtdCho-specific phospholipase C (a putative mechanism of transmembrane signal transduction) which appears to be selective for PtdCho present in the outer leaflet of the myoblast plasma membrane. Activation of PKC results in a marked increase in both 1,2-DAG (1,2-diacylglycerol) and PtdOH (phosphatidic acid) contents of L6 myoblasts. We propose that enhanced PtdInsP2 breakdown (possibly

triggered by an influx of calcium) transiently activates PKC which, in turn, stimulates the PtdCho-specific phospholipase C. Selective hydrolysis of PtdCho, present in the outer leaflet of closely apposed myoblast plasma membranes, could trigger myoblast fusion by the removal of a significant fusion barrier (polar phosphocholine headgroups) and the accumulation of fusogenic lipids (both 1,2-DAG and PtdOH).

Transmitter release evokes calcium signals in perisynaptic glial cells.

B.S. Jahromi, R. Robitaille and M.P. Charlton. Dept. of Physiology, University of Toronto

In the brain, glial cells embrace synapses and are thus well positioned to have a regulatory role in synpatic trnsmission. For instance, glial cells respondto many transmitter chemicals and can be depolarized by potassium and accumulates bear active neurons. However, the physioogical relationship between glial cells and nerve treminals is difficult to study in the brain.

The modulation of perisynpatic glial cells by activity of a single synapse was investigated, in situ, at the frog neuromuscular junction by monitoring the changes in intracellualr calcium (Ca++) with a confocal laser scanning microscope using the florescent calcium indicator FLUO3. Motor nerve stimulation induced an increase in intracelluar Ca++ responses in these glial cells which was greatly reduced when transmitter release was blocked. Furthermore, local application of the co-transmitters acetylcholine or adenosine triphosphate evoked Ca++ responses, even in the absence of extrecelluar Ca++. We conclude that transmitter released during synaptic activity can evoke release of intracelluar Ca++ in perisynaptic glial cells. This Ca++ signal may play a role in the maintenance or modulation of a synapse.

The effect of multiple copies of human s100B gene on the growth rate of glial cells.

Janet Huang, A. Marks MD, Dave O'Hanlon, C.H. Best Institute, University of Toronto.

The s100 protein is a 20kDa calcium-binding proptein composed of two highly similar subunits, s100 and s100B. The s100B subunit is expresed preferentially by glial cells in the mammalian brain and is implicated in the regulation of cell growth and differentiation. The human gene for s100B has recently been cloned and localized to chromosome 21, in the 21q22.2-21q22.3 region, within the critical region of Downs syndrome.

SND.1.SLOW, a cell line derived from C6 glial cells by transfection with the human s100B gene, is characterized in this study. Southern analysis using the KN3 cDNA probe recognizing the 3.1kb restriction fragment of the human s100B gene DNA has shown that 20-30 copies of the human s100B gene has been incorporated into the nuclei of SND.1.SLOW cells. Using the rat s100B cDNA probe, both the C6 and SND.1.SLOW cell lines have been shown to be tetraploid since they contain four copies of the rat s100B gene. In Northern analysis, the human KN3 riboprobe hybridized strongly to the 1.0 kb band representing the human s100B mRNA expressed by SND.1.SLOW cells; whereas the rat BP2 riboprobe hybridized weakly to the 1.6 kb band containing the rat s100B mRNA expressed by SND.1.SLOW cells producing a signal similar in strength to that in C6 cells. The high level of human s100B mRNA production and s100B protein expression (as shown by Northern and Western blots, respectively) correlates with the high number of copies of human s100B gene incorporated in SND.1.SLOW cells.

In both the C6 and SND.1.SLOW cell lines, induction of s100B protein expression is observed on the day prior to the onset of the stationary phase of growth. This result is compatible with the hypothesis that induction of s100B proten expression is mediated by cell contact.

Growth experiments have demonstrated that SND.1.SLOW cells have a doubling time (in logarithmic phase) of 33 hours which is approximately twice that of the C6 cell line which is 16 hours, implying that the high level of human s100B expression retards rat glial cell growth and division. This finding suggests the higher level of s100B protein expression (trisomic) in Downs syndrome may retard the growth of glial cells in the developing brain, which may in turn impede the growth and differentiation of neurons, thus contributing to the mental retardation seen in Downs syndrome.

Clinical Investigation Category

Graduate Student	Non-graduate students
1st - Craig McKinley	1st - Lawrence Weisbrod
	2nd prize (two winners) - David Ng and Howard Ginsberg

In vitro evaluation of gallstones dissolution with MTBE and ultrasound energy.

Craig McKinley BScEE, MScEE, John Hunt PhD, John Rickets BSc, David Lu MD

Given the large number of cholecystectomies performed annually, a nonsurgical approach to gallstone therapy is of some interest. An ultrasound system has been developed to enhance methyl-tert-butyl ether (MTBE) dissolution of human gallstones. A mathematical model which

quantitatively characterizes the dissolution process via a rate constant has also been developed. Using this model, dissolution of noncalcified gallstones with a continuous wave (CW) configuration of the ultrasound system showed a 49.5-fold increase in dissolution rate over a technique where the gallstones were dissolved with MTBE alone, and a 6.2-fold increase in dissolution rate over a technique where the gallstones were dissolved with aspirated MTBE. The CW configuration also approached a two-fold increase in dissolution rate over various pulsed mode configurations. Gallstone calcification was observed to play a significant role in the dissolution rates.

The effect of incision placement on cataract wound astigmatis.

Lawrence Weisbrod, W.S. Dixon, MD, FRCS(C)
Sunnybrook Health Science Centre, Toronto

We performed a prospective, randomized clinical study of 50 consecutive patients scheduled for elective extracapsular cataract extraction with posterior chamber lens insertion to determine the effect of wound placement on postoperative astigmatism. Twenty-five patients had their incision located at the corneoscleral limbus; 25 had their incision 1 mm posterior to the corneoscleral limbus. Keratometric astigmatism was measured pre-operatively at one week, one month and three months after surgery. The mean corneal astigmatism for the two groups at the different intervals was analyzed using analysis of variance. The mean corneal astigmatism differed significantly at each interval postoperatively ($p<0.05$). Linear regression analysis showed that there was no significant difference in the rate of stabilization of the astigmatism. A Fisher's exact test showed that more suture cutting was required to correct the astigmatism with a limbal incision ($p<0.0001$). The conclusions to this prospective study are threefold: an incision placed 1 mm posterior to the limbus (a) offers a reduction in postoperative astigmatism, (b) does not offer a faster rate of stabilization of the astigmatism, and (c) eliminated the need for suture cutting to reduce postoperative astigmatism, when compared to a limbal incision.

Work-related burns: A six-year retrospective study.

D.Ng, D. Anastakis, L.G. Douglas and W.J. Peters, Ross Tilley Burn Centre, Wellesley Hospital and Division of Surgery, University of Toronto.

In Canada, there are no published studies on burn injuries sustained in an occupational setting. For this reason, the present study was designed to analyze retrospectively all work-related burn patients admitted to the R.T. Burn Centre over a six-year period.

From July 1984 to May 1990, 193 patients (30.2 per cent of all patients) were admitted to our regional adult burn centre, for treatment of work-related burn injuries. The median age of patients was 32.5 years (range 18-64), and 94% were males. Fifty-nine per cent of the patients came from Metropolitan Toronto, and 40% from rural Ontario. Most of the patients (97.3%) were referred to the burn centre within 24 hours of their injury. The most common aetiology was electrical injury (29.5%), followed by flame (24.4%), contact (10.4%), flash (9.8%), tar and asphalt (9.3%), scald (7.8%), chemical (5.1%), steam (4.7%) and grease (1.0%). Within the elecltrical burn group, about one-half were flash burns, one-quarter were clothing fire injuries, and one-quarter were contact injuries.

These occupational burns tended to be extensive injuries. The median body surface area (BSA) was 16.5 per cent, with a median full thickness (FT) component of 5.0 per cent. The average length of stay was 20.0 days. Inhalation injury requiring intubation occurred in 14.8 per cent of patients. Sepsis - confirmed by positive blood cultures - developed in 14 per cent of the patients, at an average of 8.8 days post-burn. Staphylococcus aureus was the commonest organism isolated from blood cultures. Pneumonia occurred in 6.3 per cent of patients. A total of 207 surgical procedures were performed on 113 of the 193 patients. Eleven patients required amputations - seven of the patients had sustained high voltage electrical injuries. The mortality rate for all 193 patients was 6.7 per cent. Non-survivors had a median burn size of 85.0 per cent, with a median FT component of 85.0 per sent.

The total cost of in-hospital patient care was $2.96 million. The total estimated time lost from work for the 193 patients was 459 work-years. Many of these injuries appeared to be preventable.

Reduction of brachytherapy-induced brain injury by the 21-aminosteroid U-74589F in a rat model.

Howard Ginsberg BASc, Jennifer Glen, Mark Bernstein MD, FRCS(C).

Interstitial brachytherapy with high activity I125 temporary implants has been shown to be well suited for treatment of selected patients with malignant brain tumors. One major factor limiting the success of interstitial brachytherapy is the difficulty of delivering a sufficiently high dose of radiation to the tumor periphery while minimizing the damage to surrounding brain tissue. Radiation toxicity is manifested acutely as an increase in cerebral edema and later as radiation necrosis.

One approach to improve the efficacy of this type of therapy is to introduce an agent which could confer radiation protection to normal brain tissue. Ideally, this

agent would act as a "pharmacological fence" surrounding the tumor, which would allow the implanted radiation dose to be raised sufficiently to optimize the cell kill effect on the tumor.

21-aminosteroids (Lazaroid) have been shown to reduce the extent of CNS damage to normal brain tissue, induced by trauma and ischemia, in animal models. This study demonstrates the ability of the 21-aminosteroid U-74389F to protect normal brain tissue from radiation damage inflicted by I125 in a small animal model. The source of radiation was placed in a precise location on the dura over the frontal lobe of male F-344 rats using a special stereotaxic frame. An irradiation dose of 80 Gy was administered to a hemispherical volume with a 5.5 mm radius. One group of irradiated animals received intravenous U-74389F (Upjohn Co.) via indwelling jugular vein cannulas. The drug was administered as 5 mg/kg just prior to seed implantation, one hour later, then every six hours for the duration of the implant (4 days), and for 24 hours after implant removal. The other group of irradiated animals received only intravenous drug vehicle (Intralipid) at the same time intervals. The animals were then anesthetized and studied using a 1.5 TEsla MRI with a gadolinium-enhanced T1 dimensional reconstruction provided by the ISG CAMRA Allegro computer system.

The mean lesion volume in the rats receiving radiation and U-74389F was 19.6 +/- 5.3 mm3 (mean +/- SEM). The lesion volume in the group of rats receiving radiation and drug vehicle only was 40 +/- 6.6 mm3. This was shown to be a statistically significant difference ($p<0.006$). Patients undergoing clinical brachytherapy in the future may benefit from the use of this drug with its effects of reducing radiation toxicity to surrounding normal brain tissue.

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Reports from the University of Toronto's International Health Program

Last summer, several students involved with UofT's International Health Program traveled abroad to experience first-hand health care in a developing country. The trips were undertaken to foster a greater appreciation for health needs in developing countries and to develop a broader understanding of the influence of culture, economics and politics on health-care delivery in contexts different from our own. Funding was graciously provided by the Uof T Medical Alumni Association and the Canadian Public Health Association (CPHA)

A Summer in the Stone Age

Geoffrey C. Ibbotson, MSc, 9T4

As the Cessna turned sharply, I caught a clear view of the valley where I was to spend the next ten weeks. The round, thatch-roofed huts scattered amongst the gardens on the hillsides presented an interesting contrast to the tin roofed huts which lined the grass airstrip. Minutes later, we landed and were immediately surrounded by several dozen black-skinned tribal men who began unloading the cargo which had filled all available space in the small plane.

I stepped out and looked for someone who looked like they worked at the hospital. "Everyone must be used to Westerners in this village" I thought, because nobody seemed to take notice of me. Suddenly, there was some commotion as our pilot got out of the plane. Mike Cooper, was the first black American pilot these people had ever seen. Within seconds, there was a crowd of over 100 unclad locals gathered around Mike who had begun talking to them in Indonesian.

The people were amazed at how well he could speak english with the Westerners and that he also flew the plane. Mike's physical appearance was almost identical to that of the local tribal people but it was not until later I learned that the tribal people made no mention of the fact that Mike had the same skin colour. Instead they were amazed he had the same kinky hair as they did. It was then that I realized these people looked at life in a very different way than I did.

I arrived in Indonesia on Friday, May 31st and reached my final destination the following Tuesday. I flew with the Missionary Aviation Fellowship because there are no roads and it would have taken me three weeks to walk there. The hospital is in the village of Mulia which is a one and a half hour flight into the interior of Irian Jaya (formerly Dutch New Guinea).

The Mulia hospital has about 35 beds and one missionary doctor and his wife and several nurses. The two most common reasons for hospital admission were malaria (P. falciparum) and pneumonia. The physician did not do much surgery although I did have the opportunity to assist in a cesarian section during my first week. The hospital serves the people of the Dani tribe who were first contacted by Westerners in the 1950's. Until that time, they had no knowledge of steel or the wheel, had no organized trade between neighbouring villages and were commonly engulfed in tribal wars which culminated in the cannibalism of their enemies. The year prior to my arrival there had been a six month war between two clans in the valley.

Shortly after I had arrived, I visited one of the hospital's outpost clinics. It took us 8 hours to walk there over the mountains. I went with one Indonesian and several tribal nurses and was the only caucasian. They do not get too many white people in that area so I was always the centre of attention. This was especially true when I would take my bath. As there is no running water besides the river, that is where the "bath" is located. The first time I bathed, the whole village turned up to watch. Since my policy is to "do as the people do", I ended up baring all since that is what the other men who were bathing did. Luckily the men chased the women and girls away, but they stayed themselves to investigate how white I really was.

When trekking, all the Dani that we met wanted to be introduced to me. Their style of greeting is to hold hands and say "Wa, Wa, Wa, Wa..." When they get excited they let out an interesting "Aieee". In addition to their hand-holding, they have an unusual custom of snapping each others index fingers. Everyone also wanted their picture taken and would get all dressed up for the occasion. When I say dressed up, I mean they put a boar tusk through the septum of their nose and put feathers in their hair (and little else). The men usually wear only penis gourds and the women, grass skirts. I spent ten days at another hospital in a village about a 45 minute flight

from Mulia. I took with me an X-ray of a tumour that had engulfed the hand of a 14-year-old girl. It needed amputation. The Mulia hospital is not accustomed to performing the appropriate anesthetic techniques so they wanted me to ask the Dutch surgeon at the other hospital if he would do it. Instead, the Dutch surgeon wanted to teach me general anesthesia so that we could do it at Mulia. For one week I learned general anaesthesia but with ether! I don't know if I will learn that in Canada outside of history books. While there, the Dutch surgeon also taught me how to do a finger amputation and supervised me while I performed one such procedure.

I lived alone in a little house and cooked for myself on a wood stove. I even learned how to cook bread. I found, soon after moving in, that I had some uninvited guests living in the rafters (rats). I did not mind them so much until one night when they got into my food stores. It was then I declared war on the varmints.

I caught one in a snap trap which I had placed in the garbage can but it managed only to snag the rat's tail. I tried to end its misery with the axe but when I missed, the clever beast quickly scampered up the axe handle with trap in tow and got out of the garbage can. I then preceded to chase it around the room trying to get it with the hatchet. Needless to say, this would have looked very funny to a bystander but it was slightly nerve-racking for me as I was in bare feet with my toes serving as inviting objects of revenge for the rat. Finally, I was able to accomplish an unorthodox laparotomy with my hatchet before my toes were seized. At the end of the summer the score was:

RATS: 4 potatoes, 3 packages of noodles;

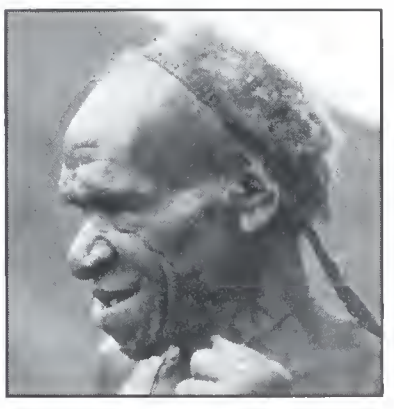
GEOFF: 14 Rats (deceased).

On a more serious note, I found myself in a very interesting situation the week before I left the hospital. The physician's wife had to fly to Java (2000 km away) to seek advanced medical attention. Her husband, the only doctor at Mulia, went with her of course. Who was left in charge? The senior nurse and myself! Luckily, the patient load was not heavy (only 15 patients). I held rounds every morning with the nurse and helped make treatment decisions. We almost lost a five-month-old baby girl who had a very bad case of meningitis. After one week of intensive antibiotic therapy, she started to come around and by the time I left, she was much improved; Thank God ! We also had two cases of pneumonia, several patients with malaria and one elderly man who was badly malnourished. Others were patients with burns, osteomyelitis, open fracture of the tibia and machete wounds.

Disaster struck one evening. It involved an old man who had been admitted for prostatitis two weeks before and was waiting for the plane to take him home (his village was a four day walk). The doctor had finished his case before he left and said I didn't have to check him. At 7:30 pm he had a sudden onset of severe, nonlocalized abdominal pain with guarding. At first, I suspected a ruptured appendix or some kind of perforation in the abdomen but had no way of knowing the exact diagnosis.

During the examination, I asked the nurses when he had last urinated. He had not urinated all day! We immediately put a catheter in and got about one and a half litres of clear urine. He continued to have severe pain. We started an I.V. and he began to calm down. It was 9:30 p.m. by this time and there was no way to call on the short wave for advice from the other two Western doctors in Irian Jaya. The whole time this was going on, the other patients from his village had gathered in the ward and were helping us and praying. I found it comforting how everyone pulled together in these situations. He fell asleep and we thought he had stabilized. However, I did notice a little blood in the urine just before I left so I had the nurses monitor it regularly (they usually don't).

At 4:30 am, I was awakened and asked to return to the hospital immediately. The patient was in shock; no radial pulse, no blood pressure, heart rate 120, very high temperature, and severe respiratory distress. Also, he had large amounts of blood in his urine. We started oxygen and dextran I.V. for a blood expander for lack of anything



else. He improved somewhat and we could get a pulse pressure of 50 mmHg and he was semiconscious.

At 7:00 am, I consulted the two Western doctors on shortwave and both said it was likely sepsis in addition to internal bleeding from a tumour of the prostate or bladder. They informed me this was common in the highland people and there was nothing I could do since there was no surgeon and we could not get a flight to fly the patient out. While I was consulting with them, a nurse's assistant came and got me because he had become much worse. When I returned to his bed, I found he had arrested so we began CPR and AR but realized it was pointless. We had done all we could. I called the other doctors back and told them. This was the fifth death since I had arrived. I get frustrated in these situations because I know that with the proper facilities some of these deaths can be prevented. Unfortunately, the facilities are very basic and the hospital has rigid financial restrictions on it, as is common to most hospitals in developing countries.

Many of the tribes in Irian Jaya are Christian. When the missionaries came, the people quickly accepted the teaching of the Gospel. One of the reasons was that the old legends told of a "white brother" who would bring the spiritual truth about the Almighty God. The legends say that at one time the people knew the Creator but lost the way to him and therefore had to appease the spirits of the jungles. There is even a legend about a great flood which killed all but eight people. The Church plays a large role in the community and consequently there is virtually no alcoholism or drugs and very little theft. This is in stark contrast with the other half of the island (Papua New Guinea) which has terrible problems with those imports of Western culture.

The Dani people of the Mulia valley stole a big part of my heart this past summer and I know the memories and experiences I gained have and will continue to change the way I look at life. May it be through simple eyes and a sincerity of heart.

Dhaka Children's Hospital, Bangladesh

Sonia Sabir, 9T3

In the summer of 1991, I received funding from the Canadian Society of International Health to replicate findings that maternal education has an impact on the nutritional status of children in Bangladesh. My survey was conducted as part of an ongoing study at the Dhaka Children's Hospital (a non-profit agency which treats 800 children a day on an out- and in-patient basis). The majority of children were from families of lower socioeconomic status. Dhaka Children's Hospital monitors the status of its patients in order to improve treatment regimens or to provide useful information to other organizations.

Due to the short period of time in which I had to conduct research and certain confounding factors, I was unable to come to definite conclusions based on my data. However, my data will be used in addition to subsequent data collected by other students to make a complete analysis. I have therefore taken this opportunity to discuss some of my personal reflections on my summer elective in Bangladesh.

I think the people who choose to work in a developing country in any capacity, see it as a challenging opportunity to find out about a different country and its culture. Perhaps they also want to discover their own ability to work in sometimes adverse conditions or in an environment which cannot provide facilities which they take for granted. I must admit I felt the prospect of working in one of the poorest countries in the world was an exciting one.

In any medical setting, the key to forming a good doctor patient relationship is open communication. Well this can be slightly difficult if there is a language barrier. Before I went to Bangladesh, I understood Bengali but I lacked fluency in it. I also had problems understanding what the mothers were saying because the majority of them were from rural communities with a dialect unlike my own "Oxford" Bengali.

I fortunately was working with a very helpful medical staff. They made themselves available to translate what the mothers were saying when it was necessary and suggested ways of rephrasing my questions. It became so easy to take a good history when I learned the common term, for example, for "bloody mucousy diarrhea." It was also amusing when the mothers thought I had a different accent because I came from the city of Dhaka as opposed to a foreign country altogether! I ultimately was able to effectively communicate and build an excellent rapport with the mothers.

Overcoming a language barrier was not the only challenge. I also had to adjust to a completely different hospital environment. The first thing that overwhelmed me when I walked into Dhaka Children's Hospital was the incredible stench. No, this definitely was not the sterile Toronto General. As I got closer to hospital beds, I noticed cockroaches crawling all over them. Call me infinitessimally feminine if you must, but I still wanted to scream. Being the highly adaptable person that I am, however, I was already settled in my new surroundings by the next day (alright, maybe the next week!)

On a more positive note, however, I was greatly impressed by the adequate facilities and radiographic equipment the hospital did have. This enabled doctors to order investigations and come to definitive diagnoses.

In addition to conducting the survey, I had the opportunity to join the other doctors during rounds. The different cases were interesting. Diseases such as T.B. (especially meningeal T.B.), shigellosis and nephrotic syndrome are endemic in Bangladesh. I know I will never come across some of these diseases in Canada. I recall studying diarrheal diseases in microbiology and being told to omit shigellosis for that very reason. A knowledge of endemic diseases, I realized, was often sufficient to make a diagnosis based on history alone. My clinical skills were truly tested and improved.

The first time I went on rounds, the staff physician pointed out a small wasted infant and asked me for the diagnosis. I suppose taking a history and physical would have been helpful but he did not give me that luxury. So I just stared at him vacantly and thought I would use the excuse that I have just completed second year and the only thing we have done so far is anatomy.

Well, he gave me a stern look and said, "This is kwoshiorkor, a form of protein-energy malnutrition." I am sure he wanted to ask me what it is exactly that we do in Canada if we do not know what kwoshiorkor is. Believe me, by the end of the summer, I was a kwoshiorkor and marasmus expert.

Dhaka Children's Hospital mainly treated patients from rural communities where medical facilities are generally not easily accessible. Many patients presented when their disease was terminal or far advanced. Having had no exposure to pediatrics and seeing children often in the most horrendous state (eg. meningeal TB spreading cutaneously and forming a sinus tract), was probably the most trying thing that I had to cope with.

I also pitied the patients and their mothers because of the incredible suffering they had to endure due to poverty. It was difficult for me to understand why a few of the doctors did not treat their patients with a bit more compassion. Instead, the doctors treated them as if they were sub-human.

At that time, it would have been so easy to become self-righteous and convince myself that this does not happen in Canada. Unfortunately, I think it does. In Canada there is also an underprivileged population (eg. alcoholics who live on the streets). I am sure there are many health professionals who act less than charitably towards these patients. I learned a valuable lesson in tolerance.

Besides doing my research in the hospital, I was eager to take pictures of Dhaka and the surrounding countryside. This was easier said than done. Since I have roots in Bangladesh and because I also wore the traditional outfits whilst I was there, I looked like any other Bengali woman. A woman who ventures outside the confines of her own home without a husband or children, is often the victim of harassment. In consideration of my safety, I usually had to rely on at least a couple of escorts to accompany wherever I went. My loss of complete independence was definitely frustrating but I knew I had to stick to local rules. It cannot ever be stressed enough how important it is to be very accepting of a different culture and to also understand the way people behave within a certain cultural context. Only then is it possible to develop a real appreciation for a country and its people.

Bangladesh, of course, is a country rich in culture. The media reinforces our belief that it is a country of filth and poverty and one that is repeatedly struck by natural disasters. What the media fails to portray, is a country which takes a tremendous pride in its art, poetry, dance or music. I attended countless social gatherings which revolved around music where everyone participated.

What I will always remember about Bangladesh is despite the poverty, the people really have a spirit of survival and derive pleasure out of simple things in life. Their ability to fight and bounce back is truly inspirational.

My experience in Bangladesh has, without a doubt, been an extremely rewarding one. I broadened my knowledge of pediatrics and tropical diseases; I learned a great deal about an eastern culture but most importantly, I now have an appreciation of medical practice in a developing country and its challenges. I encourage you to take advantage of an opportunity to work abroad.

Elder Abuse: A Silent Crisis

Shabbir M.H. Alibhai 9T3

Abstract

As we head toward the year 2000, the elderly constitute a greater proportion of Canadian society than ever before. It is predicted that this squaring of the population pyramid will likely continue. There is a concomitant increase in awareness of the needs and concerns of elderly people. Though elder abuse is not a new phenomenon, it is finding increasing recognition among health care workers, as well as society in general. Unfortunately, its incidence is also increasing. This paper defines the concepts of elder abuse and neglect, discusses their prevalence, and profiles both the abused and the abuser. Current theories regarding etiology, methods for recognizing elder abuse, and recommended guidelines for intervention are also outlined.

Introduction

As a population, we are aging. According to Statistics Canada, there were 3.2 million Canadians in 1980 over the age of 60. This figure is expected to rise to 4.5 million by the year 2000. The most rapidly increasing age group consists of people 75 years of age and over. The overwhelming majority within this group are women, more than half of whom are widowed[1]. Along with the change in population profile, there is a growing awareness of the needs and concerns of elderly people. Senior citizens are, on average, among the lowest level income earners in society[1]. They also have a greater number of health problems than their younger counterparts[1]. More and more of them are becoming dependent on family and social support systems. As we age, social service programs such as housing will become insufficient to meet our needs, and more elderly people will have to live in multigenerational households with their adult children[1]. The trend in most of these households is toward two working adults, with consequent shortage of care for the dependent elderly person. In some of these households the caregivers themselves will be over the age of 65, caring for parents who are in their eighties[1].

Against this background, the concepts of elder abuse and neglect can be introduced. It was not many years ago that, while there was a Society for the Prevention of Cruelty to Animals, there was no organization concerned about child abuse[2]. Today there are laws and mechanisms to deal with child abuse[2]. Elder abuse is not a new phenomenon; it has existed for many years, although there was in the past - and still is to some extent today - a reluctance to acknowledge its existence[3]. Despite media coverage, recognition of elder abuse is at the stage child abuse was 25 years ago; many people still question the extent to which it occurs[2]. In most cases, elderly people are well cared for by someone with love and compassion, but if the responsibility of caring falls into the wrong hands - that of someone who is unprepared, uneducated, reluctant, or downright incapable of assuming the responsibility - then the elderly person is placed in a situation that may inevitably lead to abuse and neglect[4]. In other cases, well-meaning caregivers encounter periods in their lives where other priorities become temporarily established, leading to unintentional abuse and neglect.

Definition

There has been considerable discussion in the literature about a suitable definition of elder abuse and neglect[1-3,5-20]. Health and Welfare Canada defines elder abuse and neglect as follows[11]:

Elder abuse may include the infliction of physical injury, restraint, financial exploitation, threats, ridicule, insult or humiliation, forced isolation (physical or social), or forced change in living arrangement.

Elder neglect is the refusal or failure to care for the older person whether intentional or unintentional (i.e. laziness or inadequate knowledge). This could include abandonment, withholding or non-provision of food, health care, companionship or assistance.

There are six main categories of elder abuse: physical abuse, negligence, psychological/social abuse, financial abuse, violation of rights, and self-neglect[2,7,8]. Physical abuse involves the infliction of pain, mental anguish through physical conflict, or deprivation by the caregiver, and includes assault, sexual abuse, and murder. Negligence involves a breach of duty or carelessness resulting in injury, isolation, abandonment, and confinement of the elderly person. Psychological/social abuse includes the denial of personal decision-making

(via threats, verbal abuse, humiliation, ridicule, unnecessary restraint, being treated like a child, etc.) and the intentional provocation of fear of violence or isolation. Financial abuse encompasses theft or illegal use of an elderly person's money or personal property. Violation of rights consists of breaching of rights that are guarantied to a citizen by law. Self-neglect involves self-infliction of physical harm, failure to take one's medications, ignorance of one's personal needs and hygiene, etc. It stems from the elderly person's diminished physical and/or mental abilities, and may be precipitated by family and relatives[8].

Several experts have criticized the terms abuse and neglect, stating that the terms tend to blame and condemn the abuser[13,21]. Instead, these individuals argue elder abuse is more commonly a case of unmet needs. O'Malley et al.[13] view it as "an abnormal expression of caretaking role in which the needs of a person for physical and emotional support are increased or ignored." They have also applied the term "caretaker-abuser" to caregivers of the elderly person, thereby denoting a source of both support and care, and abuse and neglect. They define elder abuse as active intervention by a caregiver resulting in the creation or sustainment of unmet needs leading eventually to injury. O'Malley et al.[13] see neglect as a failure on the part of the caregiver to resolve a care need despite awareness of available resources. These definitions emphasize the elderly person's need for assistance without undermining the responsibility of the caregiver to assure that care needs are being met. This shifts emphasis from the abuser to the unmet care needs, which greatly facilitates intervention[13,21].

Prevalence

Elder abuse is an international problem, with an incidence and prevalence slightly less than child abuse[4,22,23]. An estimated four percent of elderly patients are victims of some sort of abuse or neglect each year[7,11,19,22-25]. If all categories of abuse are included, up to 10% of all elderly over the age of 65 are affected[26]. However, only one out of six cases of elder abuse is reported, compared to one in three in child abuse[22,23,27]. And two recent articles in the popular press have suggested that the incidence of elder abuse is increasing[28,29].

Studies have found that passive neglect is the most common form of elder abuse[4,6,19,27,30]. Rather than occurring as isolated incidents, abuse of the elderly is recurrent in up to 80% of cases[6,13]. Other studies done in the United States have found elder abuse occurs among all racial, ethnic, and socioeconomic backgrounds[6,30,31]. At least one group suggests that historically, elders were not treated with the reverence and veneration as is commonly thought today[27]. The following anonymous traditional rhyme, quoted by several authors, is also meant to indicate the early existence of transgenerational violence[31]:

'When I was a laddie
I lived with my granny
And many a hiding me granny gi'ed me
Now I am a man
And I live with my granny
And I do to my granny
What she did to me.'

The Abused

There is considerable agreement in the literature regarding common characteristics of the abused elder. O'Rourke[32], in summarizing earlier studies, found abused elderly were usually white, female, "old-old" (i.e. 85 and over), living with relatives, and physically and/or mentally impaired. Other studies have generally agreed[2,4,7,16,19,30,31]. Starr[33] suggests that elderly victims often internalize blame for the abuse, are passive, socially isolated, compliant, and loyal to the abuser. Table 1 summarizes common characteristics of elderly victims of abuse.

Table 1: Common characteristics of the abused elderly

Caucasian
Female
75 years of age or older
Physically and/or mentally impaired
Financially not self-sufficient
Often widowed
Living with children or relatives

The Abuser

Starr[33] suggests that abusers are generally possessive of their victims, externalize blame for their anger, confuse roles by expecting victims to meet a wide range of their needs, displace anger from some authority-type figure to a family member, have poor impulse control, lack empathy, and grew up in a violent environment. Other researchers have found abusers often had a lack of understanding of the aging process[19], unrealistic expectations of the elderly person's capabilities[19], and lacked communication skills[16,33]. Abusers were often found to have a history of substance abuse[2,4,16,19], and were usually close relatives or long-term (10 or more years) caregivers of the abused[2,4,7,16], stressed financially and emotionally[4,16], and themselves abused in the past[16]. The majority of abusers were male[2,7]. Most studies agreed that caregivers - faced with increasing stress from a physically and/or mentally deteriorating elderly person, financial hardships, and social isolation - were often overwhelmed by the seemingly inextricable situation, leading to abuse[4,16,19,30,31,33]. Common characteristics of abusers are summarized in Table 2.

Table 2: Common characteristics of abusers

Close relative of caregiver
Usually son, daughter, or spouse of abused
Living with abused elder
Psychologically stressed
History of substance abuse
Often under 30 or over 60 years
In financial difficulties
Personality problems

Etiology

One of the most difficult aspects of elder abuse is attempting to determine the cause(s) of the abuse. Five theories of causation of elder abuse have been identified: Impairment Theory, Individual Abuser Pathology Theory, Internal Family Dynamics Theory, Internal Stress Theory, and External Stress Theory[34].

Impairment Theory argues that elderly persons who are more physically and/or mentally impaired are more likely to be abused. They are seen as more dependent and more vulnerable to abuse and neglect[6,13,20,34].

The Individual Abuser Pathology Theory suggests there is some personality trait or character disorder which causes the abuser to be abusive, e.g. psychiatric illness, substance abuse, or mental handicap. Thus the caregiver may not be able to judge rationally the complex needs of the elderly person[20,31,34].

The Internal Family Dynamics Theory holds that violence is a learned behaviour, where children who are abused or observe violence internalize it as a normal and acceptable reaction. This in turn leads to a cyclical family pattern where the child becomes an elder abuser[13,16,20,31,34].

The Internal Stress Theory proposes that abuse is a result of the mounting stresses placed on a caregiver by a dependent older person[6,13,31,34]. These caregivers often have somatic and psychosomatic complaints such as headache, anxiety, insomnia, and depression[20,34].

The External Stress Theory postulates factors such as income, employment status, marital and/or other family discord may alter the incidence of elder abuse[16,33]. Major life crises such as death of a loved one, loss of job, divorce, etc. can trigger the abuse[13,20,34].

Though there are many advocates for each of the above theories, all have been criticized as lacking strong empiric evidence[27]. Nevertheless, these theories serve as a foundation for those who wish to understand the phenomenon of elder abuse. Recently, it has been argued

that elder abuse is multifactorial in nature, and that each of the above theories has a role, to a lesser or greater degree, depending on the specific situation[1,27,35].

Recognition

In order to recognize elder abuse, it is important to have a general profile of both the abuser and, more importantly, the abused person in mind[35]. Over the years a variety of assessment tools have been developed, but the basic concept of recognizing certain typical signs and symptoms has not changed. The most common signs and symptoms of elder abuse are summarized in Table 3.

The key to detection is proper assessment with a high degree of suspicion[36]. This should involve a thorough physical and psychological evaluation of the elderly patient, along with an assessment of the caregiver's ability to provide care[14,36]. Victims most frequently present to their physicians with complaints of medical problems in their attempt to seek help[4]. A barrier frequently encountered here is denial of possible abuse by professionals[27,37]. Current perceptions may reflect a belief that although it is unacceptable to beat a spouse, and horrible to beat a child, no one beats an elderly parent[37]. Society often has ageist (i.e. discriminatory against the elderly on the basis of age[38]) attitudes toward older people that further complicate the issue[27,31]. These perceptions and attitudes must be identified and overcome before the problem can be adequately dealt with.

Behavioural observation is an important aspect of patient evaluation when looking for elder abuse as behavioural indicators may be the only clues to verbal or emotional abuse[3,4,37]. Both the elderly person and the caregiver must be carefully observed for signs of an abusive relationship.

Table 3: Common signs and symptoms of elder abuse

Physical abuse
- Unexplained bruises, welts, or burns in various stages of healing, unilateral or bilateral
- Bruises forming recognizable patterns or shapes
- Lacerations and abrasions of the lips, eyes, or other parts of the face
- Head injury, such as bruising or haemorrhage beneath the scalp (indications of repeated hair pulling), with/without alopecia
- Multiple, unexplained fractures of ribs or long bones
- Sprains or dislocations
- Genital/anal bruises or bleeding
- Shivering/cyanotic, flushed, or changes in body temperature

Neglect
- Poor hygiene, dress
- Pallor, dehydration, malnutrition
- Unattended physical needs
- Impaired skin integrity
- Depressed or oversedated
- Lack of glasses, hearing aids, dentures

Psychosocial Mistreatment
- Depression/anxiety
- Agitation/trembling/cowering
- Sleep disorder
- Feelings of guilt/hopelessness/helplessness
- Ribbons in hair, toys, "baby talk"
- Passive and withdrawn

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The elderly person often displays a state of generalized fear or anxiety, and may even cringe from the caregiver if s/he is present[4,31,37]. The caregiver may appear to be obsessed with control, hostile toward the elderly person or physician, excessively concerned, provide improbable explanations for symptoms, or harping on about the burdens of caregiving[4,20]. Often the caregiver will not exhibit appropriate assisting behaviours, which can be verified by a corroborative history from neighbours and/or relatives[27].

When possible, an in-home assessment should be performed as an integral part of the overall evaluation[4,20,27]. Locks on essential areas of the home, such as refrigerators, kitchen cabinets, and the telephone, unusual or inaccessible location of the older person's bedroom, barriers to necessary facilities, multiple medications (especially unreported sedatives), can alert health-care professionals to the possibility of mistreatment[4].

All of the above should be used whenever possible to investigate the existence of elder abuse. An assessment tool should be used to document accurately findings and clinical suspicions[14,34]. Corroborative evidence should be gained wherever appropriate, but this is often difficult. However, unless definitive evidence is available to health care workers, no interventions can be planned and/or implemented because of current laws. This is in sharp contrast to child abuse, where health care workers are obligated by law to report even suspicions of child abuse.

Interventions

The most important aspect of dealing with elder abuse is prevention. Families need help in dealing with the various stresses in their midst, especially those created by caring for elderly people[1]. These stresses are seen as the forerunners of violence and abuse[2]. Podnieks[39] has suggested five ways to prevent abuse: (a) reversing society's approval and promotion of violence in the community and at home; (b) using all possible means of reducing stresses within families; (c) facilitating meaningful relationships between families, neighbours, and the community to help counteract the isolated existence of many elder persons; (d) changing the balance of power, decision-making, and sharing of household tasks to alleviate the gross inequalities with discrimination toward elderly; (e) interrupting the historical cyclical patterns of violence in families. Prevention is aimed at the roots of family violence and builds a foundation for decreasing the future incidence of abuse[2].

Inherent in any good prevention protocol is education[1,2,27]. As mentioned above, there is often difficulty in recognizing existing cases of abuse, and many health care professionals do not report or follow up suspicious cases[2]. Help should be provided to families to understand better the aging process. This enables them to develop more realistic expectations of elderly people's abilities[1]. Society in general must also be educated to become better aware of the existence of elder abuse[1,19,27]. Only through proper education can we hope to halt and reverse the increasing incidence of elder abuse.

Though prevention is a laudable goal, it is part of an ideal system that unites forces from government, the health care professions, grassroots organizations, and families. This will take considerable time to achieve. Consequently, a system must be in place in order to deal effectively with the violence that seems to be more and more a part of our society[2,19,27]. The Ontario Report[2] suggests that this protection system include the following components: (a) adequate counselling and support services for families and the vulnerable frail elderly; (b) mandatory reporting legislation similar to that which exists in several other provinces and many states; (c) protective legislation - such as guardianship - to allow care to be provided temporarily to vulnerable seniors; and (d) emergency shelters for the abused, properly equipped to meet their needs.

Several basic guidelines for intervention are suggested. However, it is important to acknowledge most elderly persons value autonomy above personal safety and comfort. These persons often reside with families, and would rather receive inadequate care living with family than excellent care in an institution[20]. Assessment and intervention are best done by a multidisciplinary team capable of dealing with all the relevant issues[13,19,20,27]. It is also important to realize that the ultimate goal of intervention should be to establish a level of care acceptable to the older person rather than to eliminate completely inadequate care[20,27,31]. Finally, though this concept is often troubling to health care workers, the competent elderly person has a right to accept being abused, regardless of the views of health professionals or society in general[20,27]. This is the opposite of what happens in child abuse, where society - through the judiciary system - determines what is in the best interest of the child.

The first phase of treatment is crisis intervention[31]. This refers to a situation in which there is "an upset in a steady state", where current coping mechanisms are deemed insufficient and new adaptive strategies must be learned[31]. Goals must include safety of the elder and immediate breaking of the cycle of mistreatment. Identified physiological deficits or alterations should be corrected, and medication toxicities treated[14]. Professional counselling should be made available to help resolve conflicts[4,30]. The specific guidelines and techniques for

crisis intervention are beyond the scope of this discussion, and are documented elsewhere[20,27,31]. The second phase involves short-term intervention. This refers to areas that require immediate problem-solving and restoration and enhancement of client functioning[31]. This phase requires specific, concrete goals that are often achieved by referrals to specific agencies and groups[13,14,19,20,27,31]. This phase usually lasts for three to six months, and involves aspects of medical treatment, counselling, and education. The next phase is long-term treatment. It involves an evolution of the client-practitioner relationship, attempts to resolve long-standing family conflicts, further counselling for victim and abuser, as well as overall program planning[31]. Risk reduction strategies should include the introduction of social services such as home care, day care, financial aid, volunteers, and home meal programs[7,19]. This phase often last two or more years while a new stable situation is negotiated and reached[31].

Conclusion

Elder abuse is not a new phenomenon and it is gaining public awareness and recognition. However, one of the most difficult areas is still acceptance. Health care workers must become proficient at recognizing elder abuse. General characteristics of abused and abusers have been defined, and can help health-care workers to set a framework for discussion to achieve better understanding of the problem. Certain signs and symptoms should alert professionals to the possibility of abuse. Interventions are divided into immediate, short-term, and long-term stages. Though legal interventions are not well-developed in this province, it is likely they will be established in the near future. If and when legal options become available, they should be considered only in cases refractory to all other forms of intervention[30]. Though this paper has focused on abuse in the community setting, there are a growing number of elderly patients who are victims of institutional abuse. However, there are currently few published papers in this area. It is disturbing to note that in the last decade, there has been little advance in the areas of treatment and enactment of protective legislation in the area of elder abuse; the health-care profession is still at the stage of describing the nature and scope of the problem."We must be aware of the crime of elderly abuse, and we must begin to initiate programs and attitudes to prevent it. We support rape-crisis centres, we fight to help the battered wife, and we speak out against child abuse in all forms. We fight for quality of life. Why are we silent when our mothers and grandmothers struggle alone and in silence in their battle for survival, for growing old in an atmosphere of dignity and understanding? We must hear the silent cries, and our voices must help them speak. We too will grow old, and we too want to live in a world of mutual respect, love and care, not increased elderly abuse, not a world of 'granny-bashing'"[40].

Acknowledgements

The author would like to thank Dr. A.L. Sclater and Dr. T.A. Izukawa at the Baycrest Centre For Geriatric Care for their encouragement, review of the manuscript, and helpful suggestions.

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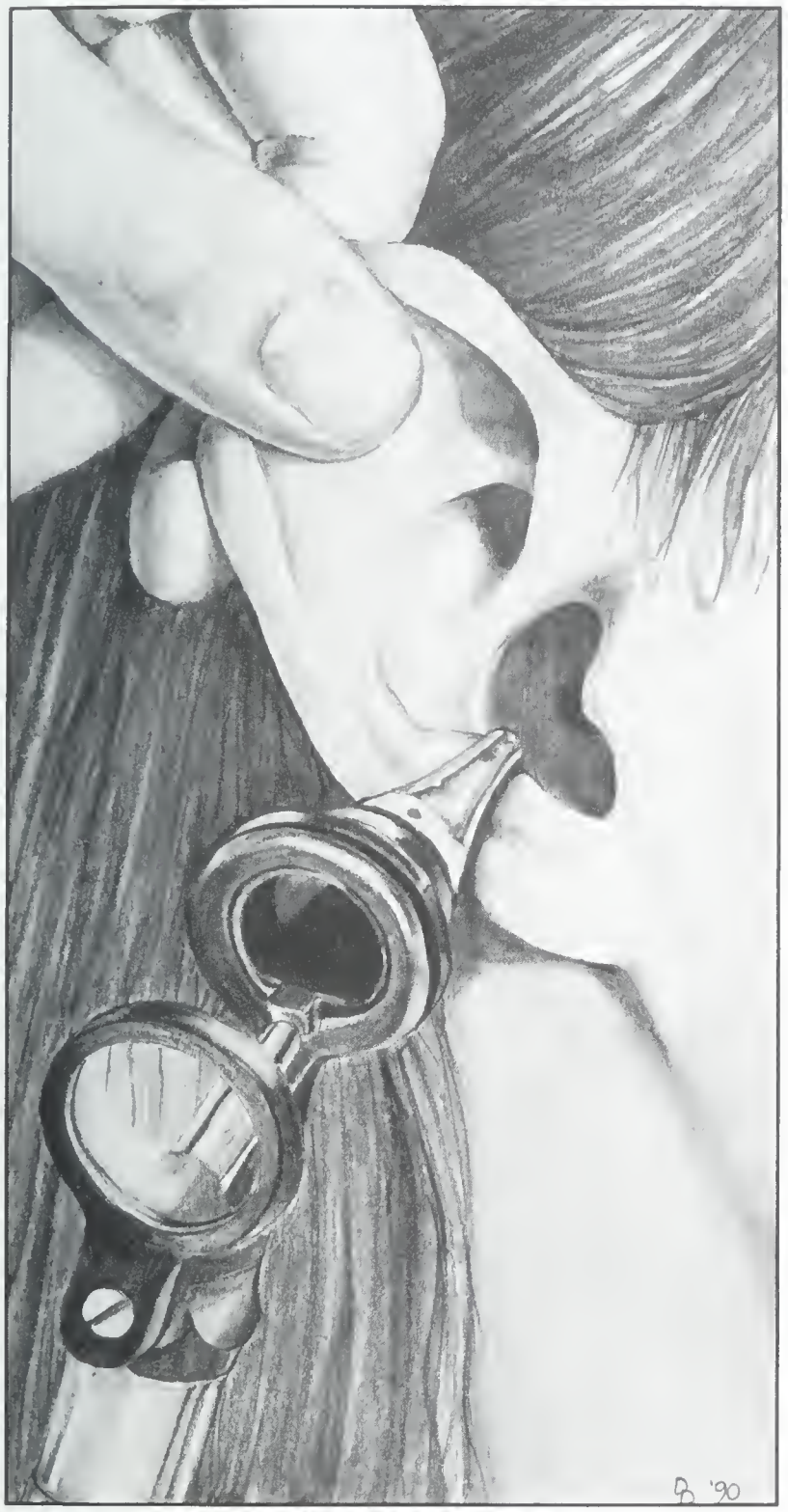

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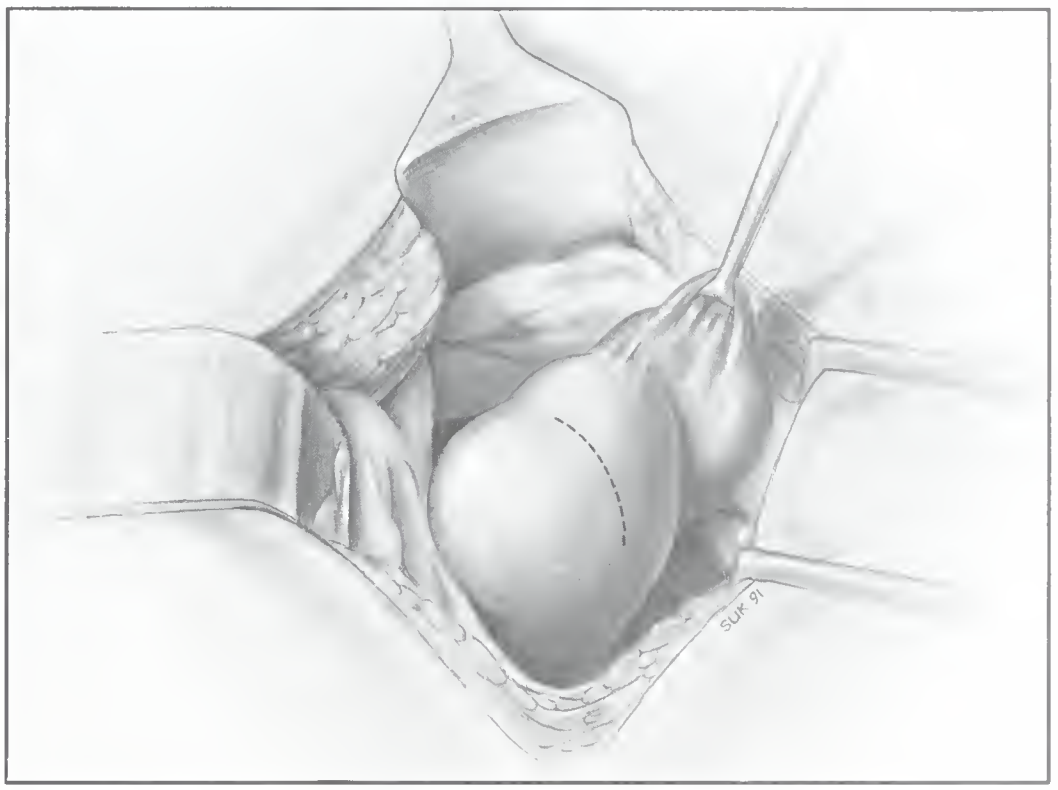

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Sarah Beaton BMC9T3, *Splenorenal anastomosis*...carbon dust on Crescent 110

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The subjects of medical illustration span most areas of teaching and research undertaken in health sciences. Students study anatomy, embryology, histology, physiology, neuroanatomy, pathology, ophthalmology, and dental anatomy with medical and health science students. The solid base of scientific knowledge gained from these academic courses is necessary to transform complicated information into medical art which communicates and teaches.

Students are trained to work in a wide variety of media, both traditional and electronic. From pen and ink and carbon dust, to interactive computer tutorial modules and videotape, Biomedical Communication students graduate with the skills to utilize media which best communicates scientific concepts.

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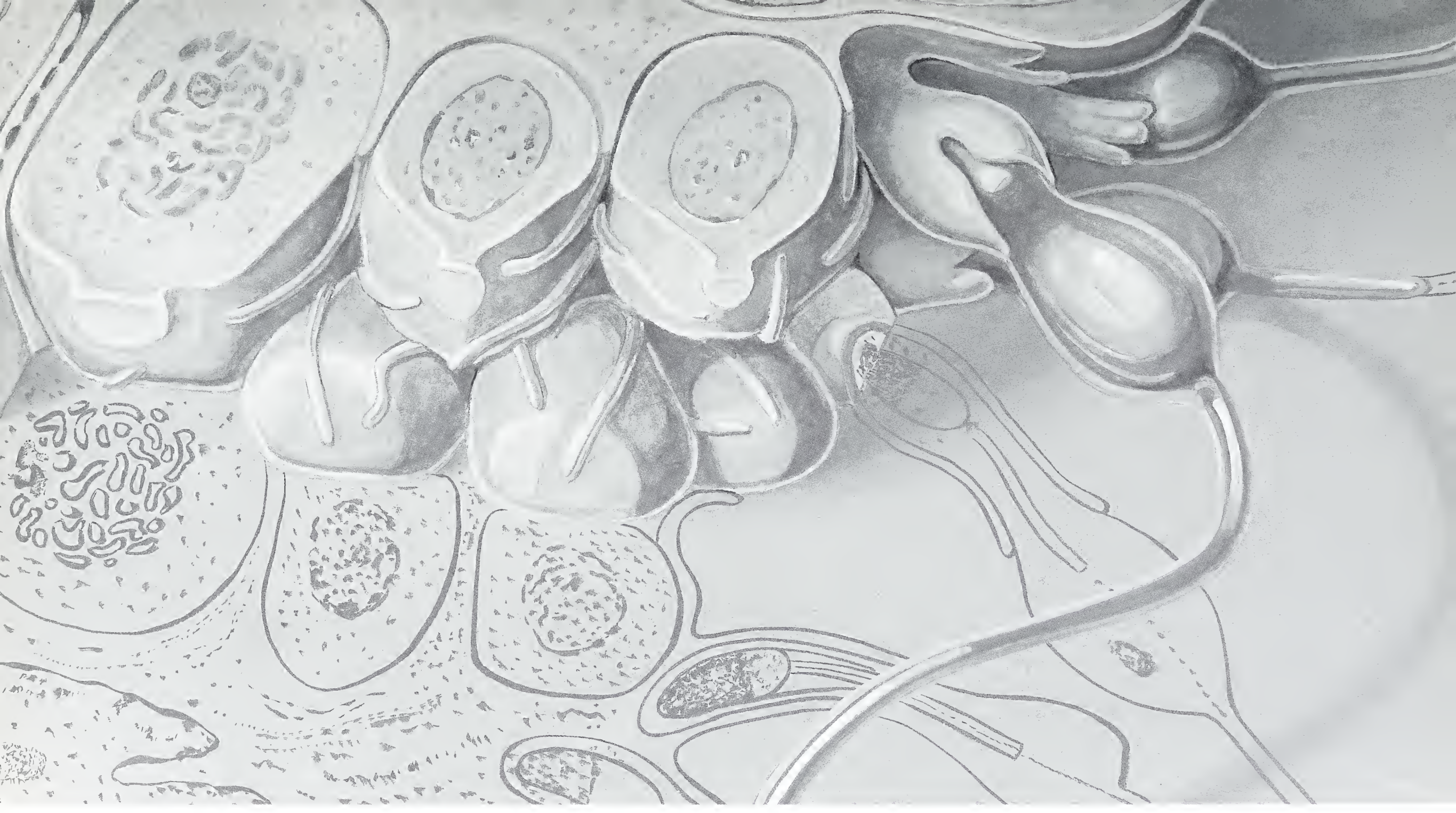

Biomedical Communications
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